

American River Watershed Project

## Post Authorization Decision Document

# American River Watershed Project

## Folsom Dam Raise, Folsom Bridge

## Appendix A: Folsom Bridge Engineering

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Sacramento District  
South Pacific Region

**American River Watershed Project  
Folsom Dam Raise  
Post Authorization Decision Document**

**APPENDIX A  
FOLSOM BRIDGE ENGINEERING**

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## ATTACHMENTS

1. Bridge Type Alternatives Assessment
2. Traffic Projections

## **SECTION 1**

### **AMERICAN RIVER WATERSHED OVERVIEW AND BACKGROUND**

The American River and Lake Natoma bisect the City of Folsom (City). For more than 40 years, access across the river had been via the historic Rainbow Bridge and Folsom Dam Road that runs atop Folsom Dam. In 2000, a new four-lane bridge, the Lake Natoma Crossing, was constructed to span the American River at Folsom's northwest edge to help reduce traffic on the Rainbow Bridge. The Rainbow Bridge still carries motorists, and an adjacent, historic, steel truss bridge, accommodates cyclists and pedestrians to and from Old Town Folsom. The two-lane Folsom Dam Road was closed indefinitely for security reasons on February 28, 2003. At the time of the closure, the road carried approximately 18,000 commuters daily. These commuters have been forced to seek new routes across the American River at either the Rainbow Bridge, Lake Natoma Crossing or other lengthier routes around the area and across other, more distant downstream bridges. The new traffic patterns that have evolved are causing severe congestion on City streets and severely impact the City's Historic District and adjacent neighborhoods.

The Folsom Dam Road is a narrow two-lane undivided road about 2.3 miles long connecting the Folsom-Auburn Road in the northwest quadrant of the dam area to East Natoma Street in the southeast quadrant of the dam area. Lane width is approximately 12 feet with shoulders that vary from 0 to 4 feet. The road is asphalt except on the dam crest, where it is concrete. Across the dam crest, gantry cranes straddle the roadway; thus constricting the road's width.

Folsom-Auburn Road is a four-lane roadway with channelized left-turn lanes and a Class 2 bike lane.

East Natoma Street is a two-lane road with a single left-turn lane onto Folsom Dam Road/Briggs Ranch Drive. The north side of East Natoma Street has been widened by an adjacent developer to provide pavement width for two westbound through lanes and a free right-turn lane onto the currently closed Folsom Dam Road.

The U.S. Bureau of Reclamation (Reclamation) and State of California Parks and Recreation have facilities that are currently accessed from a signalized intersection on Folsom-Auburn Road at the west end of Folsom Dam Road. Reclamation's facilities, including the American River Water Education Center (ARWEC) require access through a guard-secured gate. Most of the other State Park facilities are accessed through the unsecured roadway connection.

When the Folsom Dam Road was open to traffic, non-motorized vehicles and pedestrians were prohibited from crossing the dam. There are various pedestrian and bike path facilities along both Folsom-Auburn Road and East Natoma Street. The most significant of these features is the Jedediah Smith Bike Trail, a Class 1 bike path that runs parallel between Folsom-Auburn Road and the American River. The bike path is grade separated to cross under the existing Folsom Dam roadway near the intersection with Folsom-Auburn Road.

The increased traffic congestion, security issues, and public concerns regarding the uncertain future of Folsom Dam Road prompted the City of Folsom to seek help from Congress. Congressional assistance was provided by Congressmen John Doolittle and Robert Matsui. Together they added language to the U.S. Army Corps of Engineers' (Corps) Fiscal Year

2004 authorization for the Sacramento District and local interests to immediately begin work on the Folsom Dam Raise project including a specifically designated temporary bridge with a cost of \$36 million. This legislation also directed the initiation of studies and the design for this new crossing downstream of the Folsom Dam to be constructed as a permanent bridge. The authorization also authorized \$30 million in Federal funds toward the construction of the permanent bridge. Construction of the bridge will proceed once a cost-sharing agreement with the City of Folsom, as the local sponsor has been executed. The Corps and the City both agree on the urgent need to fast-track the design and construction of the Folsom Dam Bridge to open it to traffic as soon as possible. Due to changes to the project's roadway alignment, driven by accommodating a proposed auxiliary spillway, this project's open to traffic date has been officially extended one year, from December 2007 to December 2008. Due to the fact that a spillway alternative has not been selected or designed, this project's roadway alignment near the Folsom Dam overlook has been aligned to accommodate the most likely gated spillway configuration. It must be noted that, due an estimated \$3 million dollars in additional costs, the roadway has not been re-aligned to accommodate the several hundred feet wider Reclamation's dam safety only fuse-plug spillway. This alignment decision was made both due to the additional costs and the perceived unlikelihood of this alternate spillway being selected and approved.

## **SECTION 2**

### **ENVIRONMENTALLY SENSITIVE FEATURES**

In support of the change from a temporary to permanent bridge the Sacramento District is preparing a Supplemental Environmental Impact Statement (SEIS) / Supplemental Environmental Impact Report (SIER). Chapters 3.0 and 4.0 of this combined document discuss all aspects of both the Affected Environment and Environmental Consequences (and any appropriate mitigation) that have been identified.

### **SECTION 3 REAL ESTATE SUMMARY**

See Appendix C: Real Estate Plan

## **SECTION 4 BASIS OF DESIGN**

At the time of this document, the design of the 4-lane roadway approaches and the 4-lane bridge are approximately 60 percent complete. Therefore, several assumptions have been made in order to develop reasonably reliable cost estimates for the Folsom Bridge project.

The roadway alignment assumes the project will advance to include a 4-lane roadway and bridge as later described in detail in this document. However, to reduce overall project costs, a base project, which includes a significant segment of 2-lane roadway, with no class 1 bike facility, as well as less work at the intersections is being considered / designed. Basically the project will 1) connect a new roadway starting at Folsom-Auburn Road at a new intersection approximately 300-feet south of the existing Folsom Dam Road intersection, 2) continue easterly and clip the northeast corner of the Lake Point Apartments, affecting some parking and the tennis court, 3) cross the American River on a three span 970-foot bridge, 4) upon touchdown will continue by utilizing approximately 5 acres from the California Department of Corrections (CDC), 5) continue in an easterly direction across the southerly edge of Federal property, 6) move through the hillside near the Folsom Dam overlook in a through cut up to 80-feet deep, and then 7) roughly parallel the existing Folsom Dam Road until the project connects to East Natoma Street with a realigned intersection.

The roadway alignment has been located to avoid impacting the most viable gated auxiliary spillway identified at this time. Although the final design of the spillway has not been determined, the roadway has been re-located an additional 300-feet southerly from the original, most cost efficient roadway alignment. The roadway profile assumes that Folsom Dam Raise project will be configured to accommodate a 7 foot raise. The new roadway grade at the east end of the overlook will need to be at elevation 488.5 (NAVD 29). The difference between locating the roadway at its most cost effective location versus the location to avoid the future spillway results in excess excavation and a surplus of approximately 750,000 cubic yards of earth and rock. The design assumes that this surplus material will be temporarily stockpiled on-site within ½ mile of where it is excavated. This stockpiling is due to the further assumption that this material is vital to the needs of future Federal projects envisioned by the Corps or Reclamation.

For the bridge, it is assumed that the structure type selected through the Structure Type Selection process will be a segmentally constructed, cast-in-place, prestressed concrete box girder structure. The piers are assumed to be constructed of reinforced concrete and the foundations constructed of reinforced concrete, mined shafts with tie-down elements for resisting seismic uplift. The bridge pier foundations will be constructed outside of normal high water. To facilitate this, it is assumed foundation construction must be above the 160-foot elevation and is preferred to be above the 165-foot elevation associated by the Corps Sacramento District to be a flow of 45,000 cfs and an 18-year return period.

The evaluation process used to determine the bridge type is shown later in this document. Detailed hydraulic modeling of the river has recently been completed by the Sacramento District and has been evaluated by the bridge designer. Section 8, Hydraulic Evaluation confirms earlier assumptions made regarding site specific scour analysis.

## **SECTION 5 DESIGN CRITERIA AND DESIGN CONSIDERATIONS**

### **5.1 City of Folsom Criteria**

The road and bridge will be turned over to the City to operate and maintain. City of Folsom “Design and Procedure Manual and Improvement Standards,” dated May 23, 2003, will be the default criteria for non-bridge project features. The new roadway will be an undivided minor arterial per City standards, modified as necessary to reflect the non-urban open space type setting.

American Association of State Highway and Transportation Officials (AASHTO) standards will supplement City standards as needed.

Caltrans Highway Design Manual (HDM) and the associated references to the HDM will be used to supplement City and AASHTO standards.

The order of preference for applying design standards is:

Primary	City of Folsom
Secondary	AASHTO
Tertiary	Caltrans HDM (Fifth Edition with English unit supplements)

The order of preference for applying standard plan drawings is:

Primary	City of Folsom Improvement Standards
Secondary	Caltrans Standard Plans dated July 2002 or more recent English Unit Standard Plans (Caltrans expects new plans to be available in April 2006)

### **5.2 Design Speed and Alignment**

The design speed for Folsom Dam Road will be 45 mph. Where feasible, a higher design speed will be used to improve safety. In general, the horizontal curves, the stopping sight distance around cut slopes, and the lengths of crest vertical curves will control the design speed. The minimum horizontal centerline curve radius will be 750 feet with a maximum super-elevation of 4 percent. This meets the AASHTO design standard for minimum curve radius for high speed urban streets.

The City classified the Folsom Dam Road (FB-Line) and the re-aligned East Natoma Street (EN-Line) as Minor Arterials. The design speed for East Natoma Street (EN-Line) is 45 mph.

Folsom-Auburn Road (FA-Line) is classified as a Minor Arterial with a 45-mph design speed at the project location.

Briggs Ranch Drive (BR-Line) is classified as a Minor Collector with a 25-mph design speed.

Briggs Ranch Drive (BR-Line) is classified as a Minor Collector except the curves to realign the roadway may not meet the City standard of a 25-mph design speed. The roadway curves may be as low as 10 MPH to minimize impacts to the private parcel north of East Natoma Street and west of Briggs Ranch Drive.

The design speed for the new Bureau access road (AR-Line) will be as high as possible. The design speed will be determined after the location of American River Water Education Center (ARWEC) is determined. A 25-mph design speed is desirable. The design speed may be as low as 15 mph depending on the ARWEC site constraints.

The Class 1 bicycle trails will be designed for 15 mph.

### **5.3 Roadway Typical Cross Sections**

The new Folsom Dam Road will have the following features:

- Four 12-foot through travel lanes (two lanes in each direction)
- Two 8-foot Class 2 bike lanes (one in each direction)
- Median left-turn lanes serving the prison shooting range and the overlook access road.
- A separated, 12-foot Class 1 Bike Lane to accommodate non-motorized vehicles and pedestrians. Where the profile grade exceed, 2 percent, pedestrian pull-outs will be installed at no greater than 400-foot spacing to provide rest areas to meet Americans with Disabilities Act (ADA) standards.
- Widening approximately 500 feet along the east side of Folsom-Auburn Road in front of the Lake Point Apartments to provide a northbound right turn lane to accommodate the eastbound free right-turn movement.
- Widening approximately 1,400 feet along the east side of Folsom-Auburn Road between the new intersection of Folsom Dam Road and the new Bureau access road to provide a northbound auxiliary/acceleration lane to accommodate the eastbound free right turn movement.

The relocated East Natoma Street will have the following features:

- Four 12-foot through travel lanes (two lanes in each direction)
- Two 8-foot Class 2 bike lanes (one in each direction)
- The intersection at Folsom Dam Road will have two left-turn lanes and one right-turn lane.

The new Bureau Access Road will have the following features:

- Two 12-foot travel lanes
- Two 4-foot paved shoulders

The new Shooting Range access road and overlook access road will have the following features:

- Two 12-foot travel lanes
- Two 4-foot paved shoulders

### **5.4 Traffic Considerations**

The traffic study prepared by Fehr & Peers Associates identified that the 20-year traffic projections would require four through lanes on the Folsom Dam Road and additional turning lanes at the intersections. Average daily traffic is projected to be 26,400 vehicles per day

(VPD) when the project is completed in two and a half years, and 29,600 VPD in 2025. The minor traffic growth over this 20-year period assumes that the City will construct a new bridge across the American River approximately one mile downstream at the Oak Avenue Parkway. That new bridge is expected to carry almost 33,000 VPD in 2025.

The following lane configurations have been confirmed by a Traffic Report prepared by Fehr & Peers:

- East Natoma Street, east of Briggs Ranch Drive, would be realigned to connect directly with Folsom Dam Road. A new signalized “Tee” intersection would reconnect East Natoma Street with Folsom Dam Road.
- Briggs Ranch Drive will be reconnected to the relocated East Natoma Street.
- Two left-turn lanes from southbound Folsom-Auburn Road to the new Folsom Bridge Roadway.
- One left and one left/combination through lane from Auto Spa Driveway to Folsom-Auburn Road.
- One unsignalized free right-turn lane from the new westbound Folsom Bridge Roadway to northbound Folsom-Auburn Road with a 1,400-foot auxiliary merge lane onto northbound Folsom-Auburn Road.
- The existing entrance to Reclamation’s property will be closed to normal traffic via an emergency / special use security gate.

Under all build alternatives, the Folsom-Auburn Road/new Folsom Bridge Roadway intersection, the East Natoma Street intersection, and the roadway between the intersections would operate at a Level of Service D (LOS D) in 2025. A six-lane bridge and roadway along with widening of Folsom-Auburn Road to six lanes would be needed to improve the LOS. A six-lane facility was not considered further due to both the intended scope of the Federal project and due to overall funding limitations.

Lane configurations and 2025 hourly traffic projections are shown in Attachment 2.

## **5.5 Accommodation of Nonmotorized Vehicles and Pedestrians**

A stated objective of the project is to maintain the Class 1 Jedediah Smith bike path that runs along Folsom-Auburn Road and to provide new access along the new Folsom Bridge Roadway for pedestrians and nonmotorized vehicles. The new Folsom Bridge Roadway will provide for nonmotorized vehicles and pedestrians with a combination of Class 2 bike lanes (paved shoulders) and a 12-foot wide separated Class 1 path. The separated path would provide access for bicycle riders and pedestrians and would be included instead of the more commonly used 5-foot raised concrete sidewalks that accommodate only pedestrians. The sidewalk and Class 1 bike path would have profile grades of less than or equal to 5 percent to conform to the provisions of the Americans with Disabilities Act (ADA) standards. These paths would be located on the north side of the new Folsom Bridge Roadway to provide upriver and dam views. The California Department of Corrections (CDC) requested that the bike path be located on the opposite side of the roadway from their facilities for prison

security reasons. The path will have connections to existing or proposed Class 1 bike paths on both ends of the project limits.

A bridge crossing is proposed to maintain separation of the existing Jedediah Smith bike path bicycle traffic from the nearly 30,000 vehicles per day that will ultimately use the new roadway. The existing grade separation would be replaced by crossing under the new Folsom Bridge. Extensive reconstruction and realignment of this existing Class 1 bike path is a required aspect of this design.

The new access road to the Reclamation facilities is currently proposed to cross the Jedediah Smith bike trail in a grade-separated configuration rather than at grade even though projected traffic volumes are expected to be very low by City standards. This grade-separated structure is being planned due to Reclamation comments about safety concerns for those accessing their facilities. Only the new Reclamation access road and the new Folsom Bridge Roadway crossing are proposed to be grade separated because of Reclamation and public safety concerns. The low-volume driveway to the prison shooting range, and the new signalized roadway connection to the Reclamation facilities at the east end of the dam, would not be grade-separated.

No equestrian facilities are proposed. Currently, equestrians unofficially share the shoulder area of the Jedediah Smith bike trail. Mixed use of the Class 1 bike path by equestrians is not included as a project feature because of the added costs to provide equestrian safety railings on the bridge structures, additional vertical clearance needed at bicycle undercrossings, and increased costs to the City for debris removal maintenance.

## **5.6 Utility Facilities**

The City of Folsom will be responsible for relocation of the utilities.

### **5.6.1 Power**

There are two major overhead power lines owned by the Sacramento Municipal Utility District (SMUD). The major line is a 230 kilovolt (kV) overhead line on steel towers that runs roughly parallel with the proposed new Folsom Bridge Roadway. The proposed alignment and new bridge currently cross the river canyon almost immediately under the existing transmission lines. Transmission lines must have 32 feet minimum vertical clearance to the construction zone. This safety clearance precludes construction of a bridge under this line unless extraordinary and extremely expensive (that is, unreasonable) construction methodologies were employed. Meetings have been held with between SMUD, Reclamation, the City of Folsom and the Corps of Engineers to discuss the relocation of their overhead power lines and the attached fiber optic cable. SMUD would prefer to perform the work in the winter between November and February when electricity usage is lower than summer peak load periods.

Two SMUD towers located on the west side of the American River and one tower at the top of the hill near the overlook are in physical conflict with the project construction. Currently SMUD and the City of Folsom are evaluating relocating all the power lines to the south side of the new roadway. This would accommodate future auxiliary spillway construction, however, it would require the installation of four additional towers as well as the removal of the existing towers. At this time, no decision has been made on the final relocation plan but it

is understood that this relocation is on the critical path due to the conflict with the new bridge's construction.

SMUD also has a 69 kV line that crosses north of the proposed new Folsom Bridge Roadway. Three wooden poles are in conflict with the project and will require relocation.

Western (Western Area Power Administration, formerly WAPA) has a 23 kV aerial line that runs from the current switching yard to the Lake Natoma Fish Hatchery. This line will need to be adjusted in elevation to accommodate the relocation of the SMUD 230 kV line and temporarily horizontally relocated to accommodate the bridge construction activities.

Other overhead and underground electric service lines also provide power along Folsom-Auburn Road and along East Natoma Street. These facilities are probably located in a franchise area and would be relocated at SMUD's expense. These would need to be investigated during the final design phase. It is not anticipated that the relocation of these facilities would affect the selection of the design alternative or the total project cost.

### **5.6.2 Large Raw Water Pipeline**

A 54-inch raw water line begins at the Folsom Dam and crosses the proposed roadway near the existing access to the prison shooting range. This facility is above ground until just north of the proposed alignments and then dives underground as it traverses to the south. The facility includes a water control tank and a large underground vault containing several water valves. The project has been designed to avoid impacting the water line, surge tank, and underground vault. Because approximately 20-feet of roadway fill will be placed over this water line, future maintenance access would be very difficult. The current plan is to encase a part of the existing water line in concrete and protect it during construction and to install a arched culvert cover over the remaining segment to allow for access to a motor controlled valve. An empty 60-inch steel pipe culvert will be placed under the roadway fill to allow for the future relocation of this water line. This water line will be impacted by the proposed spillway construction project.

### **5.6.3 Reclamation Water and Sewer Facilities**

The existing Reclamation facilities are currently served by a City water supply from Folsom-Reclamation is fed to a City sewer line in Folsom-Auburn Road and will not be impacted. Removal of the sewer pumps at the existing ARWEC complex will be included as part of the City of Folsom responsibility for right of way relocations. No new connections to City facilities are proposed, except for any new service requirements at the new ARWEC relocation site.

### **5.6.4 Gas Lines**

No gas lines have been identified in the project limits.

### **5.6.5 Other Utilities**

Underground water and telephone lines are located along Folsom-Auburn Road. On East Natoma Street and approximately 200 feet north along Folsom Dam Road, there are underground water and sewer lines. None of these facilities appears to be adversely affected

by the proposed project. Any relocation identified during final design would be the Accommodation of New Facilities

### **5.6.6 Accommodation of New Facilities**

With the possible exception of 4-inch plastic conduits for future City use, no new utilities are proposed to be included in the project.

### **5.7 Civil Design Evaluation**

The Sacramento District Resident Engineer office is currently under construction in an area approximately 1,200 feet southeast of the dam. This new office site will be used for this project. Due to project short-term underutilization of this new facility, an evaluation is underway to consider making a part of this new office facility available to contractor in a joint-use fashion with Corps of Engineers personnel. As alternatives, the contractor's offices could be located either near the Resident Engineer's office or at the Folsom Dam Overlook parking lot. Contractor staging areas would include existing property at various locations on both sides of the river, which may include the following:

- Existing bulk storage area currently used by Reclamation
- Existing ARWEC location once the facility has been relocated
- Five-acre disturbed area bisected by the proposed new Reclamation Access Road
- Existing surplus area along the road that provides access to the stilling basin
- Folsom Dam Overlook parking area
- Potential surplus private property located north of East Natoma Street and southwest of Folsom Dam Road (known as the triangle parcel) around the new proposed roadway.

### **5.8 Highway Design Criteria**

#### **5.8.1 Highway Design Criteria**

The project will be designed for a 45 mph safe operating speed. The roadway profiles will not exceed 5 percent in order to help meet ADA standards.

#### **5.8.2 Pavement Design Criteria**

The pavement will be asphalt concrete and will be designed based on a calculated 20-year Traffic Index in accordance with Caltrans HDM. The City of Folsom has specified a Traffic Index TI=11.5 for the new roadway. The City does not have truck classifications by axle or an accurate forecast of truck usage. The City normally uses a TI=10 for urban arterial, however, the TI was increased because of the unknown additional truck trips that would result for construction activities associated with future construction at Folsom Dam.

Other TI's are as follow:

<b>Roadway</b>	<b>Traffic Index</b>
Folsom-Auburn Road	11.5
Reclamation Access Road	10.0
Shooting Range Road	8.0
New Access Road to Overlook	11.5
Relocated Briggs Ranch Drive	8.0
East Natoma Street	11.5

Structural section properties will be included in the Roadway Materials Report. In general, the structural sections will have a base course of Aggregate Base and an asphalt concrete surface.

### **5.8.3 Sound Walls**

Sound walls are proposed adjacent to the Lake Pointe Apartments. The wall will be composed of masonry block and will meet City of Folsom aesthetic standards. The sound wall's height will be determined based on a noise study. In California, the maximum height is usually 16 feet, which is usually not high enough to protect the second story of buildings. The height limitation is based more on aesthetics, because walls over 16 feet are too visually imposing.

Reclamation has requested a sound wall to lower the noise levels at their administration buildings. The noise study is currently being updated to determine the effect of constructing an 8-foot sound wall at the top of the slope above ARWEC and at the southerly edge of their parking lot. It is not know how effective this wall will be in reducing background noise levels.

### **5.8.4 Retaining Walls**

Retaining walls will be required in fill sections to protect sensitive environmental features (Folsom Lake) and to reduce right-of-way impacts to existing Reclamation facilities. The contractor will not be allowed to select the type of retaining wall. Because the City of Folsom will be required to maintain the retaining walls, the walls will be limited to cast-in-place concrete.

### **5.8.5 Signal and Lighting**

**Signals and Intersection Lighting** - Signals and intersection lighting will be designed to City standards. New or modified traffic signals are needed at:

- Folsom-Auburn Road at the new Reclamation Access Road (modify signal proposed by the developer on the west side of Folsom-Auburn Road)
- Folsom-Auburn Road at the existing intersection of Folsom Dam Road (modify signal to remove the access from Reclamation property)

- Folsom-Auburn Road at the new the intersection of the Folsom Bridge Roadway (new signal coordinated with the signal to the north)
- Folsom Dam Road at the relocated East Natoma Street intersection (new signal)
- East Natoma Street and existing Folsom Dam Road (remove signal)

**Highway Lighting** - Highway lighting will be designed in accordance with City standards. The following lighting will be provided in addition to the signalized intersection lighting:

- Superstructure lighting of the new Folsom Bridge
- Intersection lighting at the Overlook access road
- City street lighting along the relocated Briggs Ranch Drive

No lighting is proposed for the new Reclamation Access Road, the majority of the new Folsom Bridge Roadway, or along the new Class 1 bike path.

### **5.8.6 Fencing and Security**

There were two main criteria for anti-terrorism and force protection: the distance from the Folsom Bridge/Roadway to the Folsom Dam face and the provision of secure access to Reclamation's facilities. No specific security criteria have been provided at the present time, and no security objections have been identified by Reclamation's as to the proximity of the proposed alternatives to the dam.

Parts of the new Folsom Bridge Roadway alignment will have a direct line of sight to the face of Folsom Dam. At it's closest point, the distance to the Dam structure is approximately 1,400 feet. The placement of the new Roadway essentially on the property line was done so to maximize the distance and to minimize the security concerns of both Federal and State interests.

Access to the Reclamation's facilities and the existing Folsom Dam Road is currently restricted. All alternatives have assumed that a secure guarded and gated access is in place and would separate the new Roadway from Reclamation access and facilities. A new intersection, approximately 1,080 feet north of the existing Folsom Dam Road on Folsom-Auburn Road, was agreed to by all parties as the best traffic solution to accommodate the new Roadway intersection at Folsom-Auburn Road. This new signalized intersection would connect with a proposed new intersection associated with a developer's proposed improvement on the west side of Folsom-Auburn Road and north of the existing Folsom Dam Road. This would provide new access to Reclamation's facilities and would be separate from any traffic on the new Folsom Bridge Roadway. This new intersection would not adversely affect the traffic level of service on Folsom-Auburn Road because the amount of traffic from Reclamation and the proposed development would be minor in comparison to other adjacent intersections.

Security fencing will be provided to restrict access to both California Department of Corrections facilities and to Reclamation's facilities north of the new Roadway on the east side of the River. In general, fencing along Reclamation property will be designed to meet Department of Defense Standards in accordance with Homeland Security Criteria. In addition to fencing parallel to the roadway/bike path, fencing is proposed to extend approximately 500 feet north along the power plant access road and 500 feet south along the bike path to

provide additional security for Reclamation's facilities. Cut off fences would extend down toward the American River up to the elevation that would not be effected by the 1 percent flood elevation only where other control measures could not be implemented at higher elevations. This fence will be 8-foot chain link with razor wire topping. Fencing along the CDC property side will conform to State standards for low security fencing (6-foot chain link). No fence is proposed on the Folsom Lake side of the project from the retaining wall near the overlook area to East Natoma Street.

### **5.8.7 Surveying, Mapping, and Other Geospatial Data Requirements**

The project was aerially photographed on June 1, 2004 and digitally mapped by Towell Surveyors under contract to the Sacramento District. The datums used were NAD 83 for horizontal and NGVD29 for vertical. The contour intervals were at 1 foot and conform to National Map Accuracy Standards. Additional coverage areas, pavement elevation shots, and American River cross sections will be obtained by field measurements. The project was mapped in Imperial units (not metric).

### **5.8.8 Contractor Access**

Contractor access will require special security provisions. On the west side of the river (Reclamation Industrial Complex), the contractor may have access from either the existing intersection on Folsom-Auburn Road or along the new alignment grade. The contractor will be required to fence operations to separate workers from the Reclamation facilities to minimize occurrences of workers needing to go through the Reclamation security gate. Installation of fencing would be required before any significant operations are underway. This access road to the power plant will also be used by the contractor to provide temporary construction access to the westerly bridge pier. The contractor will be required to include temporary security fences and automatic gates that could only be operated by the Reclamation or the ARWEC tram driver.

Temporary access to the westerly bridge pier would be constructed by the contractor from the power plant access road.

On the east side of the river, the contractor would be provided access from East Natoma Street. It is proposed that the existing guard check point that is located approximately 0.5 mile from East Natoma Street be relocated midway in the Folsom Dam Overlook area to eliminate the need for contractor workers to pass through the secure area. The area between this new guard location and the river would be fenced to restrict access to Reclamation property. In addition, the contractor will need temporary access to approximately 10 acres of CDC property in addition to the 5 acres to be acquired. This area would be fenced as the first order of work and would be fenced to the same security level as the permanent CDC security fencing.

### **5.8.9 Stage Construction**

Construction staging will be required to maintain the limited Federal and State traffic flow on the existing roadway between the Folsom Dam Overlook and East Natoma Street. In general, the south side of the road will be constructed while traffic remains on the existing roadway. After half of the road is constructed, the north half of the roadway will be constructed. Traffic will be stopped periodically for earthwork operations. There will be up to a one year

period when this limited access traffic will need to drive over unpaved roadway grades. A detailed traffic staging plan will be included as part of the project plans.

Bicycle traffic on the Jediah Smith bike trail will be maintained at all times. Construction will be staged to provide safe paved access at all times. Because the path will cross the construction work area, it is anticipated that approximately 800 feet of temporary bike path will be needed to relocate the bike traffic away from the construction area.

Access to the power house for both Reclamation employees and the ARWEC tram will be maintained. Traffic will be subject to delays during grading and blasting operations; however, the contractor will be required to schedule the construction operations to provide uninterrupted access for the scheduled tram trips.

## **5.9 Construction Methods and Constraints**

The major site constraints that have been identified for this project are the high-voltage power lines, the need for unimpeded dam operations, and the rugged terrain. Bridge construction typically cannot take place directly under power lines because of the safety hazard involved. Typically, cranes are involved for lifting and placing construction elements, and the presence of power lines where the crane boom could contact them poses a serious safety risk. Therefore, either the bridge location must not be under power lines, or the lines must be relocated.

Because of potential flows from the dam, it is not advisable to attempt constructing a bridge span that requires falsework over or adjacent to the river. Therefore, we have considered primarily bridge types whose construction method would not require falsework at least for the main span.

The rugged terrain will affect contractor access to the bridge site. All alignment alternatives put the bridge in very steep sections of the canyon. Therefore, contractor access to the bridge pier locations, whether by cutting in access roads or other means, will be first orders of work. The rugged terrain could also make falsework placement for the back spans of the bridge that do not cross the river difficult and expensive to construct.

From a materials standpoint, a concrete bridge may be the most economical alternative. Current structural steel prices continue to run at all-time highs. Additionally, no steel fabrication plants are located in the state; generally, this adds several months to structural steel project schedules to allow for out-of-state fabrication and transportation. The project site location is also restrictive in the means of transporting steel elements to the site. The majority of bridges constructed in California are concrete bridges. Therefore, local contractors are most familiar with concrete bridge construction, and the material suppliers are more readily available.

## **5.10 Safety and Security**

There were two main criteria for anti-terrorism/force protection (AT/FP): the distance from the Folsom Bridge Roadway to the Folsom Dam face, and the provision of secure access to Reclamation facilities. No specific security criteria have been provided at the present time, and no security objections have been identified by the Reclamation regarding the proximity of the proposed alternatives to the dam.

Additionally, the roadway facilities will be evaluated for compliance with the DOD standards for occupied buildings. In any circumstance where the stand-off requirements of the DOD Building AT/FP Unified Facilities Criteria (UFC) are not met, appropriate mitigation measures consistent with the UFC will be applied.

Parts of the new Folsom Bridge Roadway alignment will have a direct line of sight to the face of Folsom Dam. At it's closest point, the distance to the Dam structure is approximately 1,400 feet. The placement of the new Roadway essentially on the property line was done so to maximize the distance and to minimize the security concerns of both Federal and State interests.

Additionally, the roadway facilities will be evaluated for compliance with DOD standards for occupied buildings. In any circumstance where the stand-off requirements of the DOD Building AT/FP UFC are not met, appropriate mitigation measures consistent with the UFC will be applied.

Access to the Reclamation facilities and the Folsom Dam Road is currently restricted. It was assumed that a secure guarded and gated access is in place and would separate the new Roadway from Reclamation facilities and access. Alternative access provisions were studied. It was determined that access to the Reclamation facilities from the new Folsom Bridge Roadway would not be feasible because an intersection between Folsom-Auburn Road and the new Folsom Bridge would require widening the bridge to provide for tapers and turn-lane storage. Additionally, this intersection would be located 10 to 20 feet above the existing grade and would require steep approaches from the north side. An alternative intersection, approximately 1,080 feet north on Folsom-Auburn Road, was recommended by the City. This new signalized intersection would connect with a proposed new intersection associated with a developer's proposed improvement on the west side of Folsom-Auburn Road and north of the existing Folsom Dam Road. This would provide new access to the Reclamation facilities and would be separate from any traffic on the new Folsom Bridge Roadway. This new intersection would not adversely affect the traffic level of service on Folsom-Auburn Road, because the amount of traffic from the Reclamation and the proposed development would be minor in comparison to other adjacent intersections.

## **SECTION 6**

### **HTRW EVALUATION**

A Phase I Environmental Site Assessment (ESA) was completed for this project in May 2005. The summary of this Assessment, discussed in Chapter 3.14 of the Supplemental Environmental Impact Statement (SEIS) / Supplemental Environmental Impact Report (SIER), identified only five (5) relative small sites, for further investigation or removal for potential HTRW release. All of these sites are on Reclamation administered Federal property. Of these five (5) sites, only three (3) are within or in direct proximity of the bridge or roadway alignment. As a part of our coordination with Reclamation, these three (3) potential sites will be brought to their attention for investigation and resolution prior to the issuing of an easement to construct this project.

## **SECTION 7 HYDROLOGY EVALUATION**

This Folsom Bridge and Roadway is not a normal water-related Civil Works project. There is no significant Hydrology Evaluation that can or should be made due to the type of working being performed. Therefore, this section is not applicable.

## **SECTION 8 HYDRAULIC EVALUATION**

### **8.1 Bridge Design Criteria**

Detailed hydraulic studies will be performed to analyze the effect of placing the bridge columns in the waterway. These studies, using the HEC-RAS computer model, are underway by the Sacramento District.

The bridge piers are proposed with footings at 173-foot elevation for the westerly pier and 193-foot elevation at the easterly pier. The top of the bridge footing would be approximately 10-feet higher than the bottom of the footing. Preliminary studies show the 165-foot elevation corresponds to roughly the 50,000 CFS release from Folsom Dam. In the last 49 years, the number of 50,000 CFS incidents increases. The incident periods where the releases exceed 50,000 CFS increases from two to eleven. Of these eleven incidents, only nine sustained releases of 50,000 CFS for at least one day or longer. Note that almost half of these nine incidents exceeded 100,000 CFS. The longest duration release of 115,000 CFS occurred over six days beginning 23 December 1964. The highest release occurred during the New Year storm of 1997 when there were 5 consecutive days where the releases were above 50,000 CFS and reached a maximum of 117,402 CFS.

Constructing the bridge piers above the 170-foot elevation provides two key assurances. The bridge would be constructed above the ordinary high water and therefore minimize impacts to the fishery resources and the contractor's construction operations are not likely to occur during the construction duration.

A rough analysis was performed to determine if the bridge piers would have a significant impact on the river flows and if the river flows would have an impact on the bridge design. Preliminary hydraulic information from Reclamation was made available for an excessively large, extrapolated 180,000 CFS discharge from Folsom Dam. This event greatly exceeds the 1 percent frequency storm (100 year) design flood flow for California Department of Transportation (Caltrans) designed bridges. Note also that a discharge level of this magnitude has never occurred at Folsom Dam since it was completed in 1955. Although Folsom Dam is capable of releasing flows far in excess of 180,000 CFS, this level significantly exceeds the expected short-duration carrying capability of the downstream levee system protecting the city of Sacramento (160,000 cfs). Even at this extreme 180,000 CFS discharge level, the bridge piers would be submerged by approximately 20-feet and there would still be over 100-feet of freeboard to the bridge structure above. The bridge piers would occupy less than 4 percent of the total waterway opening at this 20-foot depth of flow. They would have no significant effect on the flood flow capacity nor would this flow affect the design of the bridge piers.

After reviewing the Army Corps' American River HEC-RAS Model Folsom Dam to Nimbus Dam (March 1, 2006) hydraulics study, an additional analysis was performed for scour at the bridge piers. Although there were no return periods assigned to the flows in the report except for the 160,000 cfs

(200-year) and the 885,260 cfs (PMF), the results presented in Table 8, Bridge Hydraulics, indicate that the 100-year flow is 115,000 cfs. From the 100-year and 200-year flow rates the 500-year flow rate was estimated to be 220,000 cfs. From Table 4 in the Corps report, Tailwater Rating Curve Upstream of Proposed Folsom Road Bridge, the 500-year water surface elevation was estimated to be 194 feet. Using this information, both the pier and abutment scour were calculated for a 500-year event using the same techniques as described in the initial scour report, Scour at Folsom Dam Bridge Memorandum (URS, 2005). From the initial study, the scour had been conservatively estimated using abutment scour because the piers were found to be only partially in the water. The approximate 200-year results from the initial report as well as the additional analysis are (rounded up to the next 0.5 foot):

Flow Return Period	Pier Scour	Abutment Scour
200-year	1.5 ft	4.5 ft
500-year	2.0 ft	7.5 ft

Based on these results it is not anticipated that the scour levels will reach the bridge foundation footings.

## 8.2 Highway Hydraulic Design Criteria

The hydrology calculations for the project have been prepared according to the *City of Folsom Procedure Manual and Improvement Standards*, May 22, 2003, Edition and the *California Department of Transportation Highway Design Manual (HDM)*, fifth edition.

The hydrology calculations for both onsite and offsite will utilize the Rational Method and the Rainfall Intensity Curve provided by the City of Folsom Procedure Manual plate 10a, to estimate time of concentration and calculate storm runoffs.

Minimum time of concentration per HDM section 832.3 will be 10 minutes.

Offsite drainage calculations will estimate cross culverts to withstand a 10-year design storm without inlet headwater rising above the top of culvert and compare to a 100-year design storm without headwater rising above an elevation that would cause objectionable backwater depths or outlet velocity per HDM section 821.3.2.

Ditches and channels will be designed for a 100-year design storm.

Roadway pavement areas for the onsite drainage will be calculated based on a 10-year design storm with a maximum spread of one-half (1/2) width of the outer lane, or travel lane, according the HDM table 831.3.

Roadway storm drainage design will utilize a 10-year design storm per City Standards, section 10.2.7. The same criteria will be used for the road ditches or channels.

Onsite drainage inlets will be placed where required at the most efficient locations given the placement of existing and planned drainage structures, low points, and points of superelevation reversal. The maximum of 500 feet per City of Folsom Standards, section 10.9.3 is also considered. Inlets in series will be separated a minimum of 20 feet per HDM 837.3 or by calculated distance.

In general, the runoff coefficient (C values in the rational formula) is chosen to be 0.90 for the paved areas, and estimated in a range of 0.39 to 0.65 for the other land uses of the watersheds per tables 819.2A and 819.2B of the HDM and shown in Table No. 1: “Runoff Coefficient for Undeveloped Areas”.

Hydraulic Design Criteria for the project have been prepared according to the *California Department of Transportation Highway Design Manual (HDM)*, 5th Edition, the *Urban Drainage Design Manual, (HEC-22)*, Federal Highway Administration, Second Edition, August 2001, and the *AASHTO Model Drainage Manual*, 1991.

Inlets hydraulic calculations will be performed by first calculating the channel or culvert capacity of a segment and compare it to the design capacity of the segment. If the design capacity in a series of drain segments exceeds the capacity of the segment, a more detailed hydraulic model is prepared to calculate hydraulic grade line in each drainage facility. Profiles will be generated for each one of the systems analyzed.

**Cross Culverts** - Culverts design will follow the procedures of the Hydraulic Design of Highway Culverts of the Federal Highway Administration.

**Ditches** - Open Channels calculations will be based on Section 5, Roadside and Median channels of the HEC-22 Design Manual. Open earthen channels with cover vegetation will use Table 5-2 to estimate degree of retardance.

A Highway Drainage Report will be prepared to document the engineering calculations and design assumptions.

## **SECTION 9**

### **GEOLOGY AND GEOTECHNICAL INFORMATION**

The project site is located in the foothills near the western edge of the Sierra Nevada range. The terrain is sloping to very steep. The bedrock at the site consists of a very strong, massive diorite (granitic) rock with an unconfined compressive strength exceeding 3,000 pounds per square inch (psi). This rock is decomposed or weathered to depths estimated to range from a few feet to 30 feet. Although the decomposed rock will be relatively easy to excavate or drill for the foundation excavation and new roadway, it contains unweathered rocks or corestones that can range from less than 1 foot to more than 10 feet in diameter. These corestones increase in frequency and size with depth until they grade into the unweathered rock mass. The depth of the decomposed rock thins along the canyon slopes until slightly weathered, to fresh rock, is exposed at ground surface on the inner canyon gorge. A key geotechnical issue for the roadway will be a thorough characterization of the depth of decomposed rock and frequency of corestones, the rippability or excavation characteristics of the rock, and the jointing and stability of excavations.

The terrain is very favorable for highway construction because the weathered rock with shallow clay lenses would provide near ideal foundations for roadway sections. No settlement issues are expected. Excavation slopes have been assumed to be 1.5 horizontal to 1 vertical in decomposed granite and 2 horizontal to 1 vertical in overburden soils. Fill slopes are anticipated to be 2 horizontal to 1 vertical. Drilling and blasting will be required in competent rock, and also will be necessary to reduce the size of corestones located in weathered rock. Sufficient fine material to construct the finished slopes will not be a problem for the contractor because the terrain has a significant amount of decomposed granite material. The finished slopes would likely be very rocky and unlikely to support vegetative growth.

The bridge piers, located near the river, would be constructed by mining operations that blast and remove area approximately 50-feet by 36-feet and up to 35-feet deep. The foundations will require tie-down anchors.

A key geotechnical issue for the proposed bridge foundation has been identified. During construction of the Folsom Dam, an old canyon (the area between the river, the current Reclamation bulk storage yard, and the power plant access road) was filled with surplus excavated material. This highly variable material consists of sand, rounded river rock, and boulders potentially up to 8 feet in diameter with depths ranging as much as 75 feet. The material was apparently end-dumped and is unconsolidated. During a seismic event, the material along the face of the slope would fail and jeopardize the structural integrity of the bridge pier and potentially the bridge abutment. The 75 feet of unconsolidated and highly variable fill also presents difficult foundation construction for the bridge abutment. Several alternative methods for addressing this slope insatiability and abutment constructability issues were investigated. The options included removal of 150,000 cubic yards of fill and replacement in a compacted and stable shape, or extension of the bridge, or partial removal and replacement. The project will remove the front face of the slope so that the face or the slope is stable at a 1.6 horizontal to 1 vertical, and remove and replace only the material between the bridge abutment and the steep slope towards the river. This reconstruction and

remediation task added approximately \$2,000,000 in unanticipated construction costs. The full removal and replacement option or the extended bridge option would have added upwards of \$6,000,000 to the construction costs.

Storage of the material that will be excavated for this slope stabilization has become a cost issue. It was assumed during the analysis of alternative methods to correct this problem, that ARWEC would be relocated and the ARWEC site would be available to temporarily store this excavated material. The project schedule has changed and the ARWEC site may not be available. As a result, a supplemental temporary disposal site will be needed and is under evaluation.

A draft foundation report and draft material report were completed in October 2005. A final report is being completed following material testing completed in February 2006 for the additional bridge pier foundation drillings.

## **SECTION 10**

### **BRIDGE TYPE CONCEPTUAL EVALUATION**

#### **10.1 Introduction**

The Architect-Engineer has been retained by the Corps to investigate bridge type alternatives for the Folsom Bridge site alignment alternatives. The purpose of the study was to determine the most appropriate bridge system for each alignment, taking into consideration a number of issues, including but not limited to: function, safety, seismic performance, construction cost, aesthetics, maintenance, environmental impact, and constructability. For this structure alternative assessment phase of the study, we evaluated a number of bridge systems for their suitability to the alignment sites. Two bridge concepts were identified, which would be developed into planning studies to determine the most suitable bridge type for each alignment. This section of the technical report documents the methodology and results of the bridge type assessment phase.

#### **10.2 Results of Structure Type Assessment**

The structure type will be a three span, cast-in-place concrete segmental bridge supported on single column piers. The bridge will be 970 feet long with a 430-foot center span and two 270-foot end spans.

#### **10.3 Bridge Seismic Design Considerations**

The bridge will be designed in accordance with all applicable Caltrans requirements for seismic design of bridges. Caltrans Seismic Design Criteria does not fully address the seismic design issues associated with the complexities of the proposed bridge. Therefore, a project-specific design criteria has been developed. The current version of these criteria is included in this report and will be further developed with input from Caltrans, Corps, and the City. The project design criteria includes applicable elements from current state-of-the-art design codes such as the AASHTO segmental guide specifications, the CEB-FIP 90 Model Code, Caltrans SDC, and AASHTO codes to achieve the desired seismic and service load performance.

#### **10.4 Project Specific Bridge Design Criteria**

The current version of the project specific bridge design criteria is included here for reference purposes. It is intended to be a living document throughout the design phase and, should it require modification or amendments, will allow for any such changes to be controlled and documented as required in the Design Quality Management Plan.

## DESIGN CODES

The bridge shall be designed in accordance with State of California Department of Transportation, (Caltrans) "Bridge Design Specifications" (BDS) Manual, April 2000, LFD Version, with updates through September 2004, modified or augmented as detailed in this document. In addition, pertinent sections of the following standards, codes, or advisories shall apply, where specifically noted.

AASHTO "Guide Specifications for Design and Construction of Segmental Concrete Bridges", 2nd Edition, 1999 with revisions through 2003.  
AASHTO "Standard Specifications for Highway Bridges", 17th Edition 2002 Edition, with revisions through 2003.

- "Improved Seismic Design Criteria for California Bridges: Provisional Recommendations." ATC-32 Report, June 30, 1996. Caltrans "Memo to Designers" (MTD) Manual, with updates through September 2004
- Caltrans "Bridge Design Aids" (BDA) Manual, with updates through March 2005
- Caltrans "Bridge Design Details" (BDD) Manual, with updates through July 2003
- Caltrans "Seismic Design Criteria" (SDC), Version 1.3, February 2004
- "1990 CEB-FIP Model Code", Comité Euro-International Du Béton, 1991
- Florida Department of Transportation (FDOT), Temporary Design Bulletin CO4-02, Requirement 1, Section 4.5.11, Principal Tensile Stresses
- ACI 209R, 1/1/92 (R 1997), Prediction of Creep, Shrinkage, and Temperature Effects in Concrete Structures
- Hydraulics Report (by USACE)
- "Draft Preliminary Foundation Report for Folsom Dam Bridge", CH2M HILL/URS Team, a joint venture, October 19, 2005

## DESIGN PHILOSOPHY

All superstructure joints are Type A

Detail bridge for future PT.

Alternative designs shall not be allowed.

Detailing shall be performed according to Method A.

Detail for structure security

Provide inspection access within hollow piers (if used). Use performance specification for ladder/stair system.

## DESIGN LOADS

This section covers all design loads except for seismic forces discussed in Section 8.

### Structural Dead Loads – DL

Assumed unfactored unit weight of concrete including reinforcement shall be

USACE Sacramento District, *A-E Guide General Instructions for Army Projects*, page V-15 reference to TM 5-809-6 for Structural Design – Structures Other than Buildings

Army TM 5-809-6, Technical Manual, *Structural Design Criteria for Structures Other than Buildings*, Chapter 3, Transportation Structures, paragraph 3-1.a. mandates design to AASHTO standards

USACE Engineering Regulation 1110-2-1806, Engineering and Design for Earthquake Design and Evaluation for Civil Works Projects, 8.b requires "Bridges on projects which are open to public access shall be designed .... in accordance with the American Association of State Highway and Transportation Officials and state design standards"

AASHTO Segmental Guide Spec 7.3.4

AASHTO Segmental Guide Spec 15.0

AASHTO Segmental Guide Spec 28.1.1

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<p>155 lb/ft<sup>3</sup>. The designer shall verify actual unit weight for heavily reinforced elements, where this would be significant to the design (probably the pier table or piers only, as related to increased seismic loads). In this case, assume a unit weight of 145 lb/ft<sup>3</sup> for unreinforced concrete and add to that an assumed “buoyant” weight of reinforcing steel = 490 lb/ft<sup>3</sup> – 145 lb/ft<sup>3</sup>.</p>	<p>Spec 6.2</p>
<p><b>Other Permanent Loads- SDL</b></p> <p>Permanent Loads are assumed to be applied at the time of construction except for future wearing surface and utilities.</p> <p><i>Vehicle Barriers</i></p> <p>Type 80I 0.39 (+) kips/ft (Interior barrier)</p> <p>Type 80E 0.60 kips/ft (Exterior barriers)</p>	<p>Pedestrian rail detailing, architectural treatment to be determined</p>
<p><i>Wearing Surface / Integral Overlay</i></p> <p>The upper 1” of concrete in the segmental superstructure structural section shall be considered sacrificial and shall not be included as part of the resisting structural element. The full layer shall be added on as additional weight. The limits of this sacrificial layer shall be included over the entire bridge deck area.</p> <p><i>Future Wearing Surface</i></p> <p>Future Wearing Surface Allowance 35 psf</p> <p><i>Utilities</i></p> <p>Utility Allowance none</p>	<p>Same approach used for Benicia Martinez</p> <p>Typical Caltrans, BDS 3.3.3, MTD 15-17, Also specified for American River Bridge at Lake Natoma</p>
<p><b>Live Loads - LL+I</b></p> <p>Live loads shall be based on:</p> <ol style="list-style-type: none"> <li>1. HS20 (or H20 or alternate military) vehicles over the structure width assuming bike path not constructed This results in 6 whole lanes applied concentrically or fewer lanes applied eccentrically. The structure shall not be designed for the number of lanes per BDS Table 3.23.1 due to segmental design convention; this is supported by the ** note in BDS 3.23.2 which addresses design for “normal highway bridges” only.</li> <li>2. One lane of HS20 (or H20 or alternate military) plus one lane of P13 vehicle (LFD only)</li> <li>3. No Light Rail loading is anticipated</li> </ol>	<p>BDS 3.7, 3.8, 3.11, and 3.12</p>
<p><b>Creep and Shrinkage Effects – R + S</b></p> <p><i>Design in conformance with</i></p> <p>Relative humidity between 60 to 70 percent say 65%</p> <p><i>Modulus of Elasticity of Concrete, E<sub>c</sub></i></p>	<p>1990 CEB-FIP Model Code, BDS Figure 9.16.2.1.1. Compare parametrically with prior version of 1978 CEB-FIP to verify no significant change result ACI 209R</p>
<p><b>Thermal Effects - T</b></p> <p><i>Coefficient of thermal expansion</i></p> <p>normal weight concrete</p> <p><i>Seasonal Variation</i></p> <p>Maximum +90 °F (+95 °F) Minimum +30 °F (+39 °F)</p>	<p>AASHTO Segmental Guide Spec 6.4.3, BDS 3.16</p> <p>AASHTO Segmental Guide Spec Figures 6.1, 6.2 (monthly daily averages, Weather.com)</p>

*Temperature gradient - TG*

Positive and negative temperature gradients: Zone 1

AASHTO Segmental Guide  
Spec 6.4.4

**Stream Flow – SF**

Found pier footings on material which cannot scout. Design for SF forces associated with the 150,000 CFS event as determined by USACE.

MTD 1-46

**Construction Loading**

*Applicable Construction Loads*

The structure shall be evaluated for erection loads during construction including the following loads: **DL, DIFF, SDL, CLL, CE, U, W, WUP, R, S, TRF (T), and TG**

AASHTO Segmental Guide  
Spec 7.4.1

*Non-Applicable Construction Loads*

Analysis and design need not consider the following non-applicable loads:  
**IE, A, – Associated with precast segmental construction**  
**CLE – Negligible for proposed construction method**

AASHTO Segmental Guide  
Spec 7.4.1

*Form Travelers*

Assumed Traveler Weights 330 kips  
Assumed Form Weights 150 kips  
(Max 16.5 ft Segments)

E-mail from Joe Showers, 1/5/05

**Combination of Loads**

*Service Load Design (SLD) and Load Factor Design (LFD)*

SLD and LFD loading combinations per BDS and as modified herein

BDS Tables 3.22.1A, and  
3.22.1B

Dead Load - D – shall include structural dead loads (DL), other permanent loads (SDL) and final accumulated erection loads (EL), when applicable.

Permanent effects of creep and shrinkage (R + S) shall be considered in all SLD loading combinations with an effective load factor (  $\gamma$  ) of 1.0.

AASHTO Segmental Guide  
Spec 7.2

When checking tensile stresses for SLD, the variable load effects shall be divided by the allowable stress increases for comparison to “normal” allowable stresses.

For all SLD loading combinations which include full live load plus impact in addition to temperature (T), temperature gradient (TG) shall also be considered with an effective load factor (  $\gamma$  ) of 0.5. For all SLD loading combinations which do not include live load but do include temperature (T), temperature gradient (TG) shall also be considered with an effective load factor (  $\gamma$  ) of 1.0.

AASHTO Segmental Guide  
Spec 7.2.2.1

For all LFD loading combinations, TG shall not be considered.

AASHTO Segmental Guide  
Spec 7.2.2.2

In addition to LFD loading combinations for Groups IV, V, and VI, permanent effects of creep and shrinkage, (R + S), shall be considered in all other LFD loading combinations with an effective load factor (  $\gamma$  ) of 1.0.

BDS Table 3.22.1A, AASHTO  
Segmental Guide Spec 7.2

#### *Barrier/Rail Loading Procedures*

Use phi factor for flexural design of 1.0 in overhang when considering lateral collision load, CT. Verify distribution of collision load at deck expansion joints.

BDS Table 3.22.1A, BDS 3.24.5.2, letter from Richard Land/Caltrans, September XX, 2002, *Modifications to Barrier/Rail Loading Procedures*

#### *Additional Thermal Loading Combination*

In addition to SLD loading combinations defined in 3.8.1, the following load combination shall be considered:

$(DL + SDL + EL) + E + B + SF + R + S + T + TG$

Allowable percentage of basic unit stress = 100%

AASHTO Segmental Guide Spec 7.2.2.1

#### *Construction Load Combinations*

##### 10.5.1.1 Segmental Superstructure

SLD allowable tensile stresses for construction load combinations shall be checked and shall not exceed limiting values in column (2) of Table 7-2.

In addition to LFD combinations defined in 3.8.1, the following load combinations shall be considered:

$1.1(DL + DIFF) + 1.3CE$

$DL + CE$

##### 10.5.1.2 Piers (Supporting Segmental Superstructure)

SLD allowable tensile stresses for construction load combinations shall be checked and shall not exceed limiting values in column (1) of Table 7-2.

In addition to LFD combinations defined in 3.8.1, the following load combinations shall be considered:

$1.1(DL + DIFF) + 1.3CE$

$1.0(DL + CE)$

AASHTO Segmental Guide Spec 7.4.

AASHTO Segmental Guide Spec 7.4.3

AASHTO Segmental Guide Spec 7.4.

AASHTO Segmental Guide Spec 7.4.3

#### **General Analysis Guidelines**

##### *Global Analysis*

##### 10.5.1.3 Time-Dependent Analysis (Erection Analysis)

The affects of pier cracking after the spans have been “closed” and frame action is achieved (when the maximum tensile stress in the pier section exceeds the modulus of rupture) shall be accounted for in the time-dependent model. Gross and effective pier section properties shall be used in pier elements as applicable at each step during the erection sequence.

AASHTO Segmental Guide Spec 3.0 Methods of Analysis, 4.0 Transverse Analysis, and 5.0 Longitudinal Analysis

##### 10.5.1.4 Service Load Analysis

Effective section properties shall be used for thermal analyses at piers that experience large moment demands as applicable to more accurately account for the redistribution of thermal moments between piers within a frame.

AASHTO Segmental Guide Spec 3.0 Methods of Analysis, 4.0 Transverse Analysis, and 5.0 Longitudinal Analysis

Should the time-dependent analysis result in pier cracking prior to opening the bridge for service, cracked pier section properties may be used when determining service loads.

#### **ALLOWABLE STRESSES**

Unless noted otherwise

AASHTO Segmental Guide Spec 9.0 Allowable Stresses

#### **Prestressed Concrete**

*Stresses at service level after losses - fully prestressed components*

10.5.1.5 Tension in the precompressed tensile zone

Longitudinal and transverse stresses, with minimum bonded auxiliary reinforcement through the joints sufficient to carry the calculated tensile force at a stress of  $0.5 f_{sy}$ ; internal tendons:

Under dead load only: 0 psi

BDS 9.15.2.2

*Cracking stress*

Modulus of Rupture  $7.5(f'c)^{0.5}$  (psi)  
*Flexure*

BDS 9.15.2.3

AASHTO Segmental Guide  
Spec 11.0 Flexural Strength  
AASHTO Segmental Guide  
Spec 12.0 Shear and Torsion

*Shear and Torsion*

*Principal Stresses*

For Construction Loading, the maximum principal web tension stress resulting from the long-term residual axial stress and maximum shear combined with shear from torsion stress at the neutral axis of the critical web shall not exceed  $3(f'c)^{0.5}$  (psi) when R + S + T loads are not included and  $4(f'c)^{0.5}$  (psi) when R + S + T loads are included, where local tensions resulting from anchorage of tendons are considered.

FDOT Temporary Design  
Bulletin CO4-02, Requirement  
1, 4.5.11.A/B

**STRENGTH REDUCTION FACTORS**

**Superstructure**

Non-seismic strength reduction factors,  $\phi$

AASHTO Segmental Guide

Seismic strength reduction factors,  $\phi$

Flexure

$\phi_f = 1.00^*$

Shear and torsion

$\phi_v = 0.85$

\* - use expected material properties

Spec Table 7-1  
SDC 3.2.1, 3.4

**Substructure**

Hollow box piers, non-seismic strength reduction factors,  $\phi$

AASHTO Segmental Guide

Other substructure elements, non-seismic strength reduction factors,  $\phi$

Substructure elements, seismic strength reduction factors,  $\phi$

Flexure

$\phi_f = 1.00^*$

Shear and torsion

$\phi_v = 0.85$

\* - use expected material properties

BDS 8.16.1.2.2  
SDC 3.2.1, 3.4, 3.6.1, 3.6.6.2

**MATERIALS**

**Concrete**

*Minimum Concrete Cover*

Minimum Concrete Cover for 75-year Design Life, Non-corrosive atmosphere/soil/water

BDS Table 8.22.1, To be  
determined by URS

*Creep and shrinkage*

Evaluated in accordance with the provisions of the 1990 CEB-FIP Model Code.

AASHTO Segmental Guide  
Spec 4.0, 5.0, and 6.5  
ACI 209R

*Modulus of Elasticity,  $E_c$*

*Concrete Strength,  $f'_c$*

Superstructure

= 6 ksi

Pier

= 5 ksi

Abutments, walls, footings

= 4 ksi

**Prestressing Steel**

Uncoated Seven-Wire Strand Grade 270 low-relaxation

Tensile strength

$f_{pu} = 270$  ksi

AASHTO M203 (ASTM A 416)

Yield strength	$f_{py} = 243 \text{ ksi}$	$= 0.9 \times f_{pu}$
Effective Modulus of Elasticity	$E =$	SDC 3.2.4
28,500 ksi		
Wobble coefficient	$\kappa = (1/\text{ft})$	AASHTO Segmental Guide Spec Table 10-2
Friction coefficient (1/rad)	$\mu =$	AASHTO Segmental Guide Spec Table 10-2
<b>Reinforcement</b>		
Typical reinforcing, Grade 60		ASTM A 615
Yield strength	$f_y = 60 \text{ ksi}$	
Reinforcing in piers, breakaway shear keys, Grade 60		ASTM A 706
Yield strength	$f_y = 60 \text{ ksi}$	
Modulus of Elasticity	$E_s = 29,000 \text{ ksi}$	
<b>DRAINAGE REQUIREMENTS</b>		
<p><math>i = 4 \text{ in/hr}</math>, time of concentration = 5 min; structure is on an “urban expressway” with 45 mph design speed; it is permissible to flood ½ the outside lane; position one nuisance drain per barrier just in advance of EB; eliminate culppers in interior barrier</p>		<p>minimize visual impacts of drain pipes, MTD 18-1 &amp; BDA Section 17</p> <p>CT HDM Chapter 800, per HCS phone conversation with Caltrans, can allow flow over joint, but CT would position one “nuisance” drain each side to pick up sand or debris in advance of the low side joint seal assembly</p>
<b>SEISMIC DESIGN</b>		
<p>Seismic design shall be performed in accordance with SDC, augmented with pertinent provisions of BDS and MTD and project specific criteria as detailed in this document.</p>		
<b>Performance Criteria</b>		
<p>The structure shall be classified as an “Ordinary Standard Bridge” despite having span lengths exceeding 300 feet.</p>		SDC 1.1, confirmed with Mike Keever/Caltrans
<p>If they are needed, breakaway shear keys shall be detailed by a procedure to be determined based on UCSD research. Keys are typically stronger than anticipated by normal means for performing calculations. Desired goal is to protect abutment piles from damage.</p>		Seismic Response of Sacrificial Shear Keys in Bridge Abutments, UCSD, May 2002
<p>Effective superstructure width for resisting seismic loading</p>		SDC 7.2.1.1

## Seismic Loading

### *Horizontal Seismic Loading (Partially Completed Structure)*

Minimum lateral strength as specified.

SDC 3.5, MTD 15-14,  
Attachment 1

### *Horizontal Seismic Loading (Completed Structure)*

Five-percent-damped elastic response spectrum as recommended by URS. The depth and characteristics of the soil deposits surrounding the footings, the proximity to controlling fault, shall be taken into consideration.

SDC 2.1.5, 6.1.2

Minimum lateral strength as specified.

SDC 3.5

### *Vertical Seismic Loading (Completed Structure)*

Although not required by SDC, since peak rock acceleration less than 0.6 g, and bridge classification is “Ordinary Standard Bridge”, consider some effects of vertical acceleration since structure is near an active fault. Caltrans will not revise SDC inside of “a couple years” but has concerns over this issue and continues to discuss it. Propose to look at SDC load prescribed but not disregard PT. Final approach TBD once superstructure reinforcing is known.

SDC 1.1, 2.1.3, 2.1.4  
Per discussions with Mike  
Keever/Caltrans

## Seismic Analysis

### *Elastic dynamic analysis*

SDC 5.2.2

### *Inelastic static analysis*

SDC 5.2.3

## Displacement Capacity

Per discussions with Mike  
Keever/Caltrans, research shows  
columns routinely have greater  
capacity than predicted therefore  
footnote 4 on SDC page 4-1 still  
applies and the D/C ratios are  
considered separately in  
orthogonal directions

The Architect-Engineer has been retained by the Corps to investigate bridge type alternatives for the Folsom Dam Bridge site alignment alternatives. The purpose of the study is to determine the most appropriate bridge system for each alignment while taking into consideration a number of issues, including but not limited to the following: function, safety, seismic performance, construction cost, aesthetics, maintenance, environmental impact, and constructability. For this structure alternative assessment phase of the study, we evaluated a number of bridge systems for their suitability to the alignment sites. Three bridge concepts were identified; these will be further investigated during the Type Selection phase of the project to determine the most suitable bridge type for each alignment. The Type Selection phase is currently under way and is considering a cast in place concrete segmental alternative, a cast in place on falsework alternative and a steel extradosed alternative. This section of the technical report documents the methodology and results of the bridge type assessment phase. Attachment 1 to this appendix shows the different types of bridge structure that were previously considered.

## **10.5 Methodology**

A structural type assessment of potential bridge types has been conducted for various beam, truss, arch, segmental box girder, and catenary bridge systems using either steel or concrete materials. The purpose of this assessment is to identify which bridge alternatives are best suited for the project. These will be investigated further during the type selection phase of project.

The following elements are considered in determining which bridge type alternatives will be investigated during the type selection process. Based on the type selection, the preferred bridge type will be selected and taken forward into the design phase.

### **10.5.1 Seismic Performance**

The seismic performance is defined in terms of repairable damage after a maximum design seismic event, considering the structural system and materials. It will consider the load path redundancy of the structural system and whether structural elements capable of sustaining large displacement/deformations while still maintaining load carrying capacity.

### **10.5.2 Geometric Flexibility**

During the design period, any changes in roadway vertical and horizontal alignment will need to be accommodated without requiring a major modification to the bridge scheme or type. Additionally, we would consider if the bridge can be widened in the future without adversely affecting the structural system and aesthetics.

### **10.5.3 Aesthetics**

Aesthetic features are evaluated, but because of the limited view of the bridge, this component may not be as important as others in the evaluation process.

### **10.5.4 Design Schedule**

Consideration is given to whether the bridge type requires a more complex and lengthy design process including whether the structural system would require component testing, wind studies, or indicator pile programs that will prolong the design period.

### **10.5.5 Environmental Impact**

Consideration is given to such aspects as whether foundation systems be constructed that minimize the need for excavation, and if falsework be eliminated or minimized during construction. Consideration is also given to whether contractor access to build the bridge would require a great deal of mitigation later.

### **10.5.6 Construction Cost**

Strong consideration is given to minimizing construction costs through detailed cost analysis of labor, materials, and equipment.

### **10.5.7 Construction Schedule**

Consideration is given to whether the bridge be constructed within the specified timeframe and whether it will be necessary to cease construction during certain months.

### **10.5.8 Construction Risk**

Consideration is given to minimizing construction risk by selecting a structure type that contractors have the demonstrated skill and experience to build .

### **10.5.9 Constructability**

Importance is given to making the construction scheme clear and uncomplicated.

### **10.5.10 Maintenance/Serviceability**

Consideration is given to components being accessible for inspection and will special equipment be required to inspect components. Additionally, consideration is given to making routine maintenance as inexpensive as possible.

## **10.6 Results of Structure Type Assessment**

The considerations listed in the preceding section were used to evaluate each individual bridge concept relative to one another and is shown in Attachment 1 to this Appendix. Some bridge types were dismissed early because they cannot achieve or are not efficient for the span lengths needed for these alignments. The evaluation process will rank the suitability of the different bridge types and determine which alternatives should be evaluated in more detail during the type selection phase.

Based on our evaluation of the potential structure types through the type selection process in the initial phase of the design, we will recommend the structure type(s) to advance into the design development phase. This evaluation is currently under consideration and utilizing the developing information that will be generated from the geotechnical investigations and the structures modeling efforts. The evaluation should be complete for the final draft of this appendix.

## **10.7 Bridge Seismic Design Considerations**

The bridge will be designed in accordance with all applicable Caltrans requirements for seismic design of bridges. Additionally, if any other bridges are required on this project, they will be designed to the standards set forth in the Caltrans Seismic Design Criteria (SDC). The main bridge is larger than what Caltrans would define as an “ordinary” bridge; the Caltrans SDC does not fully address the seismic design issues associated with the complexities of the proposed bridge. Therefore, a project-specific design criteria has been developed at the beginning of the project as per Caltrans practice. An initial draft of these criteria is included in this report and will be further developed with input from Caltrans, Corps, and the City of Folsom. The project design criteria includes applicable elements from current state-of-the-art design codes (such as the American Association of State Highway and Transportation Officials [AASHTO] segmental guide specifications, the CEB-FIP 90 Model Code, Caltrans SDC, and AASHTO codes) to achieve the desired seismic and service load performance.

Interaction with the City of Folsom is needed to determine whether this bridge should be designed to a higher seismic standard than typical bridges. Factors such as this road being a designated emergency route by the City or critical for use by emergency vehicles are considerations for determining whether to design to a more stringent, important bridge standard.

## **10.8 Project Specific Bridge Design Criteria**

The *Draft Bridge Design Criteria for the Folsom Dam Bridge*, prepared by the CH2M HILL/URS team, is included here for reference purposes. It is intended to be a living document throughout the design phase and, should it require modification or amendments, will allow for any such changes to be controlled and documented as required in the Design Quality Management Plan.

## **SECTION 11 DISCUSSION OF ALTERNATIVES**

The consideration of alternatives was limited to four-lane alignments that began at or near the existing intersection of Folsom-Auburn Road and terminated at the existing intersection of East Natoma Street.

Consideration was given to evaluation of a two-lane bridge with four lanes at the terminus intersections. This alternative was not carried forward because it would provide a significantly worse traffic level of service and fail to meet the needs of the project. The traffic study concluded that a four-lane project was needed to accommodate the significant increase in traffic expected immediately after construction completion, and a second four-lane bridge approximately 1 mile downstream is needed in the next 20 years. Normally, consideration would be given to provide for future widening of the bridge, but this long-span high-level bridge cannot be easily widened; the cost to widen such a bridge by one lane in each direction would probably exceed the initial cost of the bridge.

One alternative alignment with differing roadway lane and intersection configurations has been advanced for final consideration. The alignment for the portion of the project from 1,000 feet east of the American River to East Natoma Street is the same for all build alternatives.

Alt 1 - No Action

Alt 2 - Four-Lane Bridge, Four-Lane Road, Full Intersections

Alt 3 - Four-Lane Bridge, Two-Lane Road, Full Intersections

Alt 4 - Four-Lane Bridge, Two-Lane Road, Partial Intersection (East)

Alt 5 - Four-Lane Bridge, Two-Lane Road, Two Partial Intersections

### **Accomplishments of Each Alternative**

Each action alternative would provide a new permanent roadway between the Folsom Dam Road intersection at East Natoma Street and Folsom-Auburn Road to the west, with a new Folsom Bridge crossing the American River downstream of Folsom Dam. Features would include a thoroughfare with approach roads, intersections with turn lanes, bridge structure, and bicycle and/or pedestrian access.

The new roadway and bridge would provide unrestricted convenient access to both sides of the river near the Folsom Reservoir. In addition, the new bicycle and/or pedestrians trails would provide new opportunities for recreation, as well as access. Each alternative would be designed to meet current transportation design and safety standards for a main traffic arterial as defined by the City of Folsom and California Department of Transportation.

### **11.1 Alternative 1 - No Action**

Under no action, the Corps would not participate in construction of a permanent bridge as directed by Congress. This alternative serves as the baseline against which the environmental effects of the action plans are evaluated. This alternative would be the same as the without-project conditions described in Section 2.1.2 of the Supplemental EIS.

## **11.2 Alternative 2 – Four-Lane Bridge, Four-Lane Road, Full Intersections**

The main features of Alternative 2 are described in this section.

### **11.2.1 Folsom Dam Road and Bridge East Approach**

Intersection of the existing Folsom Dam Road and East Natoma Street. The existing intersection at Folsom Dam Road and East Natoma Street would be reconfigured to accommodate four lanes of traffic flow and improve traffic circulation. A new signaled T-intersection would be constructed to the northwest, replacing the existing four-way intersection. At the T-intersection, two left turn lanes and one right turn lane northbound, and two left turn lanes and one right turn lane eastbound would be provided to accommodate traffic flow. New four-lane segments of roadway would be constructed east and southwest from the new intersection, eventually transitioning into the existing two lanes of East Natoma Street.

This new configuration would eliminate the existing intersection with Briggs Ranch Drive. This would reduce traffic and minimize disturbance in the adjacent residential neighborhoods. A new segment of Briggs Ranch Drive would be constructed, providing access to the residential area from East Natoma Street. A new T-intersection of Briggs Ranch Drive would be located southwest of the new intersection of Folsom Dam Road and East Natoma Street. At the T-intersection, one left turn lane and one right turn lane would be provided to accommodate traffic flow; however, left turns onto the new segment of Briggs Ranch Drive would not be allowed.

Portions of the old intersection of Folsom Dam Road and East Natoma Street would be removed. The existing segment of East Natoma Street south of the old intersection would likely be abandoned.

Roadway from Intersection to Bridge. The new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to a point where the roadway turns westward about 1,000 feet south of the Folsom Dam Overlook driveway. Construction of this portion of the roadway would include some cut into the existing hillside to provide clearance for the new four-lane roadway. Additionally, there would be a 300-foot-long retaining wall along the east side of the road to support the fill material for the roadway. At the veer-off point, the road would rotate to the southwest below the new gated auxiliary spillway structure and then continue west above the CDC facilities to the river. The roadway would cross about of 9 acres of CDC property.

Construction of each new roadway segment would include site preparation (cut or ripping, fill, and grading), laying a base of gravel, laying the riding surface of asphalt, and finishing the road with striping. The excess cut or ripped material would be removed, temporarily stockpiled, and reused for future work by Reclamation. Construction right-of-way on the roadway would be 10 to 15 feet beyond the cut and fill line. The new four-lane roadway would have 12-foot-wide lanes and 8-foot-wide shoulders, and be designed for traffic traveling at 45 miles per hour.

Work along the existing Folsom Dam Road alignment would be done in stages (half the roadway at one time) to accommodate movement of limited restricted traffic during

construction. The old roadway surface (asphalt) would be removed, incorporated into roadway fill, or recycled.

Reclamation and Prison Access Roads. Construction of the proposed gated auxiliary spillway would convert part of the staging area for the Folsom Dam Modification Project to a concrete outflow structure. The remaining portion of this area would likely be used as a staging area for the bridge project, and an access road for vehicles, equipment, and construction materials would be provided.

An intersection with left and right turn lanes would be constructed at the west end of the new retaining wall. This intersection would provide access to the Overlook and to the dam for Reclamation's operations and maintenance activities. In addition, a paved left turn pocket would be included in the roadway design to facilitate future construction of a spur to provide access for maintenance of the spillway.

Farther west, an access driveway from the new Folsom Bridge Roadway would be provided to Reclamation and City of Folsom's water control structure. In addition, a non-signalized, at-grade intersection with a left turn lane would be constructed at the existing access road to allow continued access to CDC's Sacramento-Folsom firing range. The locked gate at the CDC access road would be replaced.

The new Folsom Bridge Roadway would continue west and connect to the east bridge abutment, which would be located 500 feet east of the river. The bridge's orientation would align slightly south to allow the road to connect to Folsom-Auburn Road just south of most of Reclamation facilities. Two temporary roads would provide access for workers, vehicles, and equipment to the bridge construction area. Access from the east would be provided via an existing paved road connected with the existing Folsom Dam Road. Access from the west would be provided via a separated / controlled modification to Reclamation's existing road to the powerhouse.

### **11.2.2 West Approach**

Roadway from Bridge to Intersection. The west bridge abutment would be located 400 feet west of the river. From the abutment, the alignment of the new roadway segment would cross the north side of the existing Reclamation storage yard, a dam service road, the northeast edge of the Lake Point Apartment complex, and south side of the ARWEC facilities, and connect to the existing Folsom-Auburn Road across from the existing driveway to the Auto Spa. This alignment would affect the ARWEC, some existing Reclamation storage and parking, and some of the Lake Point Apartment parking facilities and tennis courts.

The steps in the construction of the roadway would be the same as the other segments of the roadway east of the river. A 1,000-foot-long sound wall would be constructed between the new roadway and the apartment complex to mitigate sound due to traffic on the new roadway. In addition, a 400-foot-long sound wall would be constructed between the new roadway and Reclamation facilities, likely along the top of slope adjacent to the Administration parking lot.

Intersection of Folsom Bridge Roadway and Folsom-Auburn Road. A new intersection would be constructed at the terminus of the new roadway at Folsom-Auburn Road. The new four-way intersection would include the Auto Spa driveway opposite the new roadway

segment. The new intersection would consist of two left-turn lanes from southbound Folsom-Auburn Road onto the new roadway, one dedicated southbound lane, and one combination lane for southbound or right turns. Northbound Auburn-Folsom Road would have two dedicated northbound lanes, a right-turn lane onto the new roadway, and a left-turn lane. The existing Folsom-Auburn Road along the Lake Point Apartment complex would need to be widened by 500 feet to add a right turn lane. Signals and medians would be provided.

The easterly leg of the existing Folsom Dam Road intersection that currently serves the Reclamation property would be closed it all but emergency or special access and replaced with a new access road. A new signaled T-intersection and two-lane access road about 1,200 feet northwest of the existing Folsom Dam Road intersection would be constructed for Reclamation use, secured access to their facilities, and access to new ARWEC facilities.

### **11.2.3 Relocations**

Several existing facilities or functions would need to be relocated prior to construction of the new Folsom Bridge Roadway segment west of the new bridge. These include Reclamation's storage yard, the ARWEC and some parking and the tennis courts at the Lake Point Apartment complex.

Materials and parking at the Reclamation's storage yard would be relocated to an area east of the Reclamation shop buildings near the existing HTRW storage area. The Federal Government would continue to own the existing storage yard property and likely leave it as open space. The relocation site for Reclamation storage yard has not been determined, however, it is assumed to be relocated near the existing substation.

ARWEC and the existing public functions of the State Parks offices would be relocated to a suitable location within an area of about 5 acres near the new intersection. Relocation of ARWEC and State Parks personnel and functions would be coordinated to minimize disruption as much as possible.

### **11.2.4 Bicycle/Pedestrian Trails**

Two types of bicycle trails would be constructed for this alternative to provide continuous access between East Natoma Street and Auburn-Folsom Road, as well as additional recreational opportunities for biking and walking. A new Class 1 bike trail would extend along the north side of the new Folsom Bridge Roadway. This 10-foot-wide trail would be surfaced with asphalt and be physically separate from the roadway. Both bicyclists and pedestrians could use this bike trail.

Two new Class 2 bike trails would extend along the north and south shoulders of the new roadway. These 8-foot-wide trails would be surfaced in asphalt and physically part of the new roadway surface. While bicyclists could use these trails, pedestrian use would be restricted to the Class 1 bicycle/ pedestrian trail.

Currently, there are several segments of existing bike trail in the project area. These include (1) Class 1 bike trails on each side of the roadway at the intersection of Briggs Ranch Drive and East Natoma Street and (2) Jedediah Smith bike trail on the west side of the river. These trails were constructed, and are currently maintained by, the City of Folsom and State Parks, respectively. The new Class 1 bike trail would connect to these existing bike trails, as well as

incorporate the segment of trail along the alignment of Folsom Dam Road north of East Natoma Street into the design.

Near the bridge, a new bike trail underpass may need to be designed and constructed about 800 feet east of the existing Folsom Dam Road intersection with Folsom-Auburn Roadway. The new bike trail at the bridge would be connected with the realigned trail. In addition, a segment of the existing Jedediah Smith bike trail would be rerouted along the river slope edge under the new bridge abutment and reconnected to the existing trail.

Along Folsom-Auburn Road, the existing segment of bike trail near the new proposed ARWEC site needs to be relocated.

### **11.2.5 Excavation, Temporary Stockpile, and Disposal Areas**

Some of the suitable excavated soil material would be used as fill elsewhere on the Folsom Bridge Project. Since the quantity of this excavated material would be sufficient to meet the fill needs of the project, no soil would need to be obtained and imported for the project. Material such as gravel, concrete, and asphalt material needed to construct the roadway, bridge, and bike trails would be obtained and transported by truck from local commercial sources.

Excess excavated material would be temporarily stockpiled within one-half mile of the excavated area. The exact site(s) have not been determined. Coordination with Reclamation and the Combined Federal Project on use and placement of excess excavated material from the bridge and spillway are ongoing.

## **11.3 Alternative 3 – Four-Lane Bridge, Two-Lane Road, Full Intersections**

The features of Alternative 3 are very similar to Alternative 2 except for (1) the segment of new Folsom Bridge Roadway between the Folsom Dam Overlook to the new bridge over the American River and (2) bicycle/ pedestrian trails. This section describes only those features that differ from Alternative 2.

### **11.3.1 East Approach**

Roadway from Intersection to Bridge. The new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to about 1,000 feet south of the Folsom Dam Overlook area, and this portion of the roadway would remain as four lanes as described in Alternative 2. However, when the roadway veers to the southwest and extends below the proposed auxiliary spillway and above the CDC facilities, it would transition to a two-lane roadway to the river.

The site preparation, roadway construction, and right-of-way would be the same as described for Alternative 2. This portion of the roadway would be a new two-lane roadway with 12-foot-wide lanes and 8-foot-wide shoulders, and be designed for traffic traveling at 45 miles per hour. Access to Reclamation facilities and access roads would be the same as described for Alternative 2.

### **11.3.2 Bicycle/Pedestrian Trails**

For Alternative 3, only one type of bicycle trail (Class II) would be constructed to provide continuous access between East Natoma Street and Auburn-Folsom Road, as well as

additional recreational opportunities for biking and walking. Two new Class 2 bike trails would extend along the north and south shoulders of the new roadway. These 8-foot-wide trails would be surfaced in asphalt and physically part of the new roadway surface. These trails would be for bicyclists only. The Class 2 bike trails would connect to the existing trails as described in Alternative 2.

#### **11.4 Alternative 4 – Four-Lane Bridge, Two-Lane Road, Partial Intersection (East)**

Alternative 4 is very similar to Alternative 3 except for the intersection of the new roadway with East Natoma Road. This section describes only the features that differ from Alternative 3.

##### **11.4.1 East Approach**

Intersection of Folsom Dam Road and East Natoma Street. A new partial intersection would be constructed to accommodate two lanes of traffic flow. The reconfigured, signaled T-intersection would be constructed across from Briggs Ranch Drive. At the T-intersection, a forced turn island would direct two left turn lanes onto northbound East Natoma Street. No right turn lane would be provided. In addition, eastbound traffic would not have access to Briggs Ranch Drive. A right turn lane would be constructed from southbound East Natoma Street onto Folsom Dam Road to accommodate westbound traffic.

New four lane segments of roadway would be constructed north and south of the intersection, transitioning into the exiting two lanes of East Natoma Street after 2,000 feet. The four lanes would consist of two northbound lanes, a left turn lane, and one southbound lane. At the intersection of Briggs Ranch Drive and East Natoma Street, a forced turn island would be constructed to direct traffic either north or southbound on East Natoma Street. Traffic would not be allowed to transition westbound to Folsom Dam Road.

#### **11.5 Alternative 5 – Four-Lane Bridge, Two-Lane Road, Partial Intersections**

Alternative 5 is very similar to Alternative 4 except for (1) the segment of new roadway east and west of the new bridge, (2) striping on the bridge, and (3) the intersection of the new roadway with Folsom-Auburn Road. This section describes only the features that differ from Alternative 4.

##### **11.5.1 East Approach**

Roadway from Intersection to Bridge. With Alternative 5, the new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to a veer-off point about 1,000 feet south of the Folsom Dam overlook driveway. Construction of the entire portion of the roadway would be two lanes and would include minimal cut into the existing hillside to provide clearance for the shoulders. With Alternative 5, a retaining wall would not be needed. The road would also veer to the southwest below the new gated auxiliary spillway structure and continue west above the CDC facilities to the river.

### **11.5.2 New Folsom Bridge**

The new bridge would be striped for two lanes of traffic to accommodate the two-lane segments of roadway on the east and west.

### **11.5.3 West Approach**

Roadway from Bridge to Intersection. The new roadway would leave the west abutment of the bridge as a two-lane road. Approximately 300 feet east of the Folsom-Auburn intersection, the westbound lane would transition into two lanes. The eastbound lane starting at the intersection, would transition from two lanes, (a merge lane roughly 1,000 feet long), and the other dedicated eastbound lane into a single eastbound lane at the bridge.

Intersection of the new Folsom Bridge Roadway and Folsom-Auburn Road. A new partial intersection would be constructed at the terminus of the new roadway at Folsom-Auburn Road. The new four-way intersection would include the Auto Spa driveway opposite the new roadway segment. The new intersection would consist of two left turn lanes from southbound Folsom-Auburn Road onto the new roadway, one dedicated southbound lane, and one combination lane for southbound or right turns. Northbound Auburn-Folsom Road would have a right turn lane, one dedicated northbound lane, and one combination lane for northbound or right turns. The new roadway would have one right turn lane and one combination lane for left turns or westbound traffic. It would also have two lanes to receive the two left turn lanes from southbound Folsom-Auburn Road, transitioning to one lane by the west abutment of the bridge.

## SECTION 12 COST SUMMARY

Table 12-1 compares anticipated construction costs of alternatives. Bridge costs are the same for all alternatives. Roadway costs assume a temporary disposal site, within ½ mile of the Folsom Dam Overlook, will be used for disposal of surplus excavated material. If a site within this distance is not available, the construction costs could increase by up to \$5,000,000 to \$10,000,000.

Alternative	Main Span Bridge	Roadway and Other Items	Total Construction
1	NA	NA	NA
2	\$31.7	\$45.8	\$77.5
3	\$31.7	\$41.0	\$72.7
4	\$31.7	\$39.6	\$71.3
5	\$31.7	\$38.4	\$70.1

### 12.1 Cost Assumptions and General Notes

This cost chart should be used only to compare the relative differences between alternatives. The total costs are shown to provide an approximation of the anticipated costs. Main span bridge costs are shown for the prestressed concrete box girder, segmental construction alternative, which is the least expensive main span bridge alternative. The bridge alternative costs are based on square foot costs generated from a survey of similar bridge types constructed under similar conditions. Following is a list of additional assumptions and considerations.

- Excavation quantities were calculated for Alternative 2 using plans completed to the 60 percent stage. Quantities for Alternatives 3, 4 and 5 were calculated from plans that were complete to the 10 percent level.
- Earthwork calculations assume excess material will be stored within ½ mile of the excavation area and can be hauled in off highway vehicles. The exact location for the surplus 750,000 cubic yards of material has not been determined. If a site with longer haul distances or highway legal haul trucks are required, the cost for disposal of the surplus material could increase by \$5,000,000 to \$10,000,000 depending on haul distance and disposal costs.
- The cost of excavation has the greatest risk of price escalation. A site for the temporary disposal of excavation from the westerly bridge abutment needs to be established.
- No costs have been included for relocation or grade separation of bicycles and the new Reclamation Access Road.

- The pavement structural section will be designed to a TI of 11.5. This corresponds to a 20-year pavement design assuming 5 percent trucks. This TI was provided by the City of Folsom.

**SECTION 13**  
**SCHEDULE FOR DESIGN AND CONSTRUCTION**

<b>Bridge &amp; Roadway design</b>	<b>June 2005 – July 2006</b>
<b>Procurement &amp; Award</b>	<b>July 2006 – February 2007</b>
<b>Open to Traffic (22 months)</b>	<b>March 2007-December 2008</b>



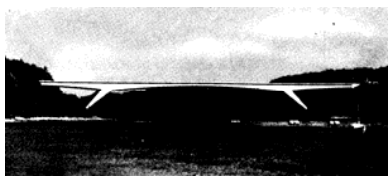
## **SECTION 14**


### **USE OF METRIC SYSTEM MEASUREMENTS**

Metric measurements will not be used. The project was surveyed and mapped in Imperial (English) units to be compatible with the surveys used by Reclamation. In addition, in mid 2005 Caltrans officially abandoned metric units for all new projects and is now in the process of publishing new design guides using Imperial units. Caltrans reversion to Imperial units was encouraged by the construction industry to make more efficient use of American-produced materials and products. This is expected to improve the contractor's efficiency and lower construction costs. The updated Caltrans publications for Imperial units are scheduled to be published in April 2006. These standards will be used for the project design.

# ATTACHMENT 1

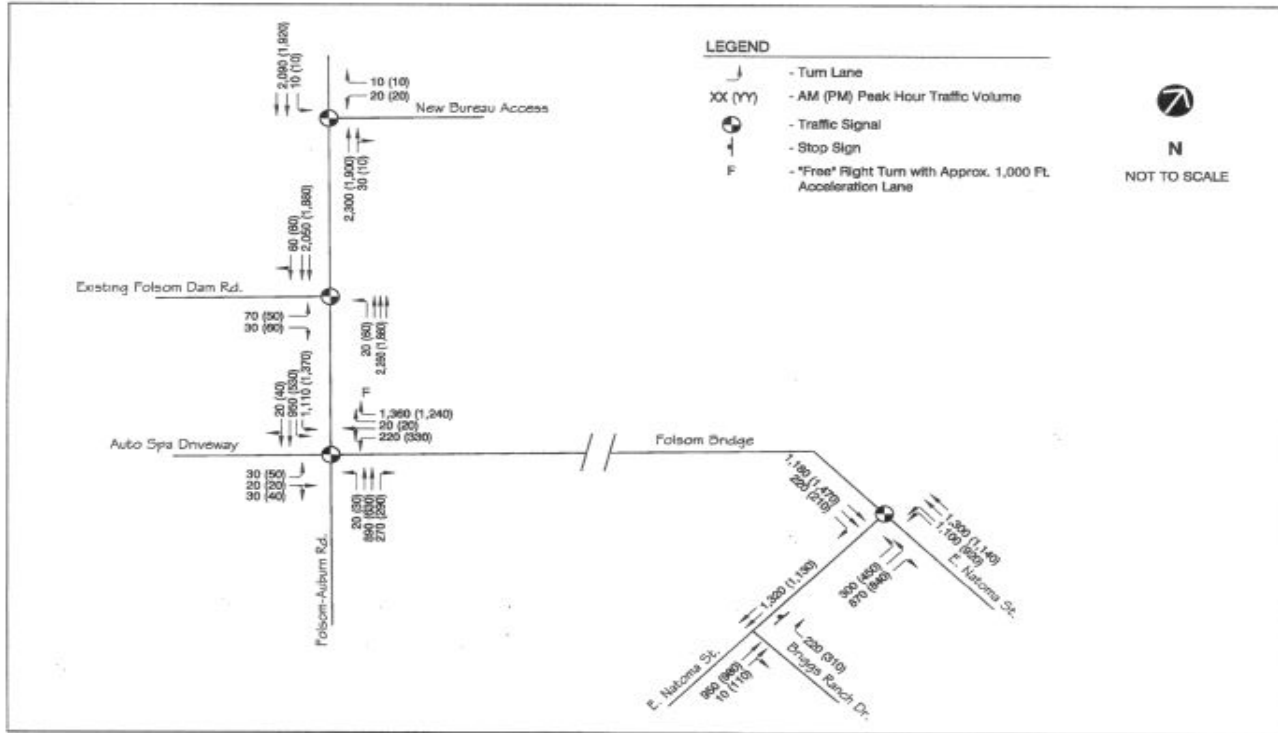
## BRIDGE TYPE ALTERNATIVES ASSESSMENT

Bridge Type	Seismic Performance	Geometric Flexibility	Maintenance/Serviceability	Aesthetics	Design Schedule	Environmental Impacts	Construction Cost	Construction Schedule	Construction Risk	Constructibility	Score
 <p><b>Alternative 1: Steel Plate Girder</b> Currently higher initial cost. Maintenance required. Reinforced concrete deck cast-in-place or precast. Replaceable deck. Construction by launching steel structure. Concrete deck constructed after completion of launching. Fabrication and transportation issues could add significant time to the construction schedule.</p>	Fair	Good	Fair	Poor	Good	Good	Fair	Poor	Fair	Good	Fair
 <p><b>Alternative 2: Prestressed Concrete Box Girder, Cast-in-Place, Segmental</b> Low initial cost. Low maintenance. Box girder built in balanced cantilever, with traveling forms for the main span. Approach spans built either in balanced cantilever or on falsework.</p>	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
 <p><b>Alternative 3: Prestressed Concrete Box Girder Cast on Falsework</b> Similar to Alternative 2 but requires falsework to be constructed within steep canyon and over river. May not be practical construction method for this site.</p>	Good	Good	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair

Bridge Type		Seismic Performance	Geometric Flexibility	Maintenance/ Serviceability	Aesthetics	Design Schedule	Environmental Impacts	Construction Cost	Construction Schedule	Construction Risk	Constructibility	Score
	<b>Alternative 4: Extradosed</b> Similar construction method to segmental construction. Stays can be encased in concrete for better maintenance performance. Few US contractors experienced in this construction.	Good	Fair	Good	Good	Good	Good	Good	Fair	Fair	Fair	Fair

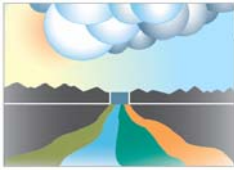
## ATTACHMENT 2

### TRAFFIC INFORMATION



**FEHR & PEERS**  
TRANSPORTATION CONSULTANTS

**BRIDGE APPROACH INTERSECTION PEAK HOUR TRAFFIC VOLUMES,  
LANE CONFIGURATIONS, AND TRAFFIC CONTROL -  
YEAR 2025**



American River Watershed Project

Post Authorization Decision Document

**American River Watershed Project**  
Folsom Dam Raise, Folsom Bridge

**Appendix B: Economic Assessment**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

**US Army Corps  
Of Engineers**  
Sacramento District

**American River Bridge Analysis,  
Folsom, California  
Economic Assessment  
March, 2006**

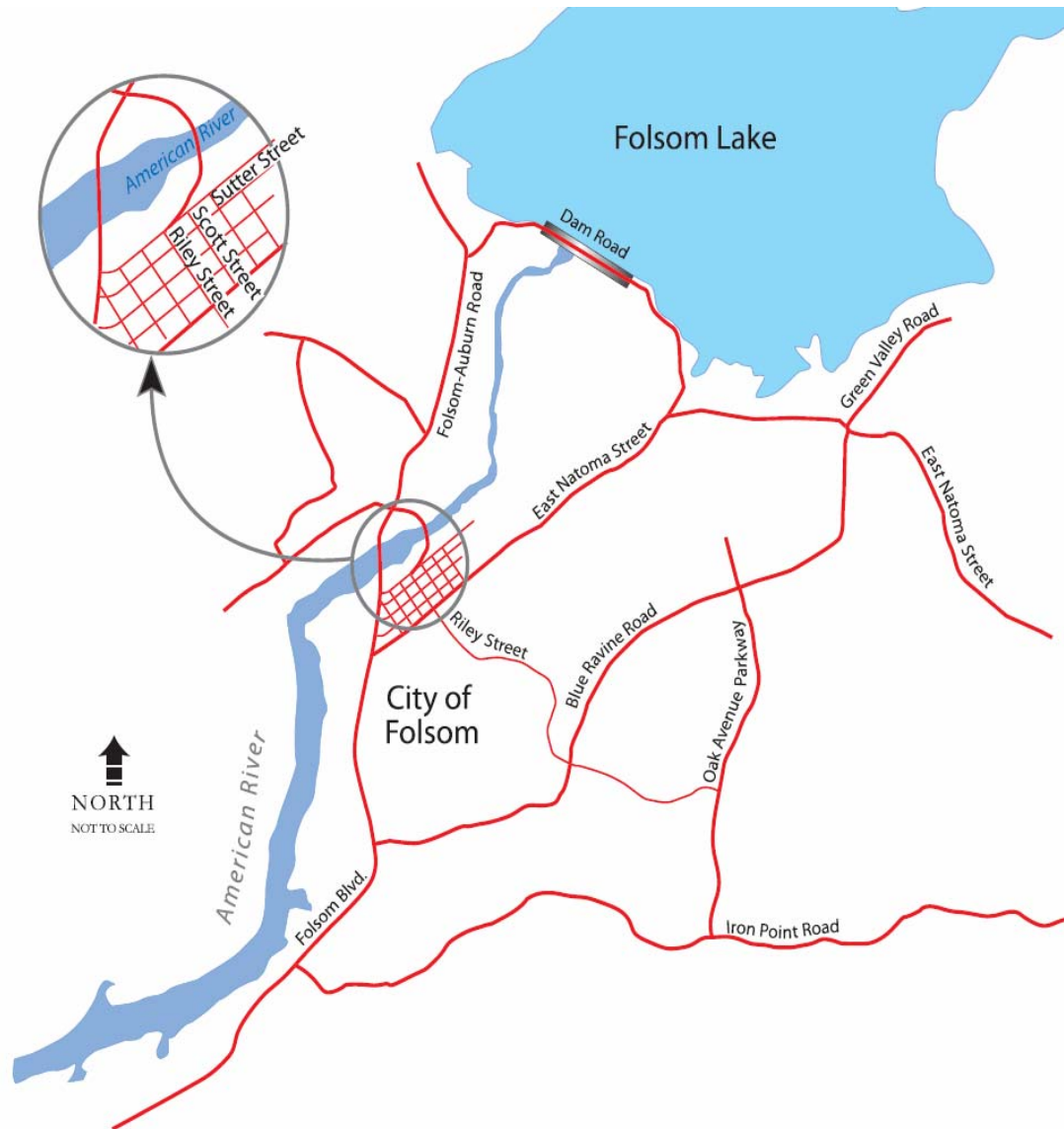
Prepared by the  
Economics Branch, Planning Division  
United States Army Corps of Engineers, Sacramento District  
Sacramento, California

## I. THE STUDY

### A. Study Area Location

The study area is located within the city of Folsom, California, on the American River located at the base of the Folsom Dam.

Figure 1. Study Area



## B. Study Purpose and Scope

The original proposal to raise Folsom Dam included the construction of a temporary vehicle bridge to provide a detour for public traffic that normally used the Folsom Dam Road to cross the American River. When Congress authorized the Corps to raise Folsom Dam in 2004; it directed that the bridge be changed to a permanent bridge so long as there is a non-Federal partner.

In February 2003, Reclamation closed Folsom Dam Road due to Homeland Security issues. An environmental document was produced to address the permanent closure of the road by Reclamation. A May 2005 record of decision stated that the preferred alternative would be the limited opening of the Folsom Dam Road until a permanent bridge is built.

The detailed description, analysis, and alignments of a permanent Folsom Bridge and its connecting approaches are presented in Chapter 2 of the Main Report.

This assessment is to present the economic analysis used to measure beneficial contributions to National Economic Development (NED) from the construction of a bridge across the American River. The analysis will consider two alternative bridges to afford alternate transportation across the American River. Other alternatives studied in the main document are based upon a variety of alignments but are not expected to influence the economic benefit estimates of a permanent bridge located in the same general vicinity for all alternatives. The bridge construction is necessitated by the restricted access of the Folsom Dam Road. A brief description of the alternatives is displayed in the Alternatives Section of this report.

## II. EXISTING CONDITIONS

The City of Folsom traditionally has had an economy based largely on the State prison industry. The economic/employment trends have begun to shift, however, with Folsom's efforts to plan for commercial and industrial parks. A number of large national corporations involved in the research, development, and manufacturing of electronic components have established regional offices and manufacturing facilities in Folsom. The high technology industry may explain why the median household income in Folsom was \$73,175, significantly higher than the median household income of \$43,816 for Sacramento County in 1999. Comparatively, Folsom's median household income in 1999 was higher than the City of Beverly Hills (\$70,945). In addition, several large retail/commercial centers have been completed or are under construction. Residential development continues to increase with single-family residential zoning comprising 32 percent of Folsom's total acreage (15,170 acres or 23.7 square miles).

Population in Folsom has grown rapidly since 1990. Between 1990 and 2000, the city experienced a 74.1 percent growth. This increase represents a compound growth rate of 5.7 percent per year over that period. The city's growth accelerated between 2000 and 2005 showing an increase during the period of 31 percent. The rate of growth over the period 2000 to 2005 was 6.2 percent per year, compared to the countywide compound growth rate of 2.4 percent during that time.

Discussions with local traffic managers indicate that traffic that has traditionally gone over the Folsom Dam Road comes from the greater Folsom commute area and not necessarily from Folsom City alone. Although studies have not definitively shown where the commuters come from it is assumed that the preponderance of the traffic would be in the outlying areas in and around Folsom City. Three suburbs lie within a short driving distance of Folsom Dam Road, Granite Bay, located in Placer County; and El Dorado Hills, located in El Dorado County and Orangevale, located in Sacramento County. The first two communities have seen significant growth in the decade of the 90's and are considered some of the most affluent areas in the Country. Granite Bay is a new community; so new, in fact that there is no census data for 1990 but the 2000 census shows a population of 19,388 with a 1999 median household income of \$93,762. Likewise El Dorado Hills has experienced significant growth over the past census period. El Dorado Hills has grown from 6,395 in 1990 to 18,016 in 2000 with a median household income of \$93,483. Orangevale is an established suburb that has seen minimal growth over the past decade, from 26,266 to 26,705 in 2000. The US Census reported a \$53,371 median household income in 1999 for the suburb of Orangevale.

As indicated, no definitive survey was conducted while the Dam Road was open to determine exactly where the traffic originated from. It can be assumed that traffic would have an equal proportion of traffic from the four communities. However some traffic may come from rural areas in and around the more prominent cities of Folsom City, El Dorado Hills, Granite Bay and Orangevale. For purposes of this study the median household income of Folsom City is used as a conservative estimate of incomes of those traveling across the Folsom Dam Road.

The total urbanized area in and around the Folsom Dam Road is estimated at over 116,000, taking into consideration the four communities immediately adjacent to the Dam Road.

Since it opened in the 1950s, the Folsom Dam Road has been used by area residents connecting Folsom City to Sacramento area suburbs and areas located on the opposite side of the American River. Construction planning associated with the Folsom Dam necessitates that closure of the Dam Road to public traffic. It has been proposed that the road that is currently being used, over the Folsom Dam, should be relocated and that a bridge be constructed over the American River to accommodate the traffic estimated at 18,000 average daily vehicles in 2002. Due to region growth the traffic demand is expected to increase significantly.

If the Folsom Dam Road were closed and no other alternative were provided, current users of the Dam Road would most likely use the Folsom-Auburn Road and Natoma and Riley streets. These detour routes have the potential of creating huge traffic bottlenecks as Folsom Dam Road traffic is diverted through the business district of Folsom. At Riley Street, for instance, cars may have to wait through as many as four light changes to drive through the intersection.<sup>1</sup>

### **III. METHODOLOGY OVERVIEW**

The economic evaluation of all benefit categories – the value of travel time delays, and the value of extra miles driven – was done in the generally accepted “without” and “with” project framework of a federal project. The “with” project condition provides for the prevention of these losses and achieves those savings associated with the project. The resulting savings represents the National Economic Development (NED) benefits. The economic methodology is provided below.

#### **Guidance and Regulation**

This economic assessment is formulated to be in accordance with ER 1105-2-100. Further, benefits and costs expressed as annual values are calculated utilizing the FY06 discount rate of 5 1/8 percent with a analysis period of 50 years. All benefits and costs are expressed at an October 2005 price level. The base operational year is 2007.

### **BENEFIT CATEGORIES**

The benefit categories fully evaluated for this study include:

1. Prevention of traffic disruptions
  - a. Value of travel time delays due to detours (motorists using Folsom Dam Road and impacted motorists using designated detours)
  - b. Value of extra miles driven due to detours (motorists)
2. Induced benefits associated with increased traffic resulting from lower congestion options available

The benefit categories that were evaluated are discussed below.

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<sup>1</sup> Conversation with Joe Gagliardi, executive director of Folsom’s Chamber of Commerce.

## **1. Traffic Disruption Analytical Framework**

The following discussion provides an overview of the analytical framework of computing economic benefits as a result of providing alternative transportation routes to Folsom Dam Road users.

(a). Value of travel time delays due to detoured motorists using Folsom Dam Road and motorists using current surface streets.

The value of time saved is an important component of the American River Bridge study as well as any water resource planning study. A project could potentially reduce the travel time for motorists using the proposed Bridge by allowing them to take less costly alternatives to the detours through the downtown area of the City of Folsom. Detours, then, incur losses of time, money and opportunity. The methodology used to derive the economic losses associated with traffic delays follows closely the methodology presented in the report, “Value of time Saved for Use in Corps Planning Studies: A Review of The Literature and Recommendations” (Institute for Water Resources, October 1991). This methodology was determined “to be the most comprehensive, logical, and applicable to Corps purposes” by experts from the Corps of Engineers.

The methodology uses several variables and assumptions to derive the economic cost (or benefit if a project is built) of potential traffic delays. These variables and assumptions – which include the number of affected vehicles (traffic volume), the incremental increase in time expenditures associated with a potential delay, median household income factors, trip purpose (work, social/recreation, vacation, other), value of the delay per minute based on trip purpose, and persons per trip are explained in greater detail below.

### **Detour Route**

When evaluating benefits due to savings in travel time, a point of origin and destination must be determined so that appropriate detour routes can be defined. For this study, traffic volume forecasts for the Folsom sub-area were generated using a modified version of the regional SACMET travel demand model (version 01). Prior to using the model, modifications were necessary to accurately reflect the detailed land use and roadway network of the particular study area given the regional nature of the SACMET Model. The SACMET model is maintained by the Sacramento Area Council of Governments (SACOG) and made available to consultants and member jurisdictions for applications such as development of traffic volume forecasts for the American River Bridge analysis. Prior to using the model, modifications are necessary to accurately reflect the detailed land use and roadway network of the study area given the regional nature of the SACMET model.

## Median Hourly Household Income

The value of time saved was estimated based on a percentage of median household hourly income. To determine the median household hourly income, the median household yearly income for the City of Folsom was used as a base. The most recent value was found on the U.S. Census Bureau website and updated with the gross domestic product (GDP) implicit price deflator to reflect October 2005 price levels. It was then assumed that a person, working 8 hours a day for 260 days per year, would work 2080 hours per year. The median household hourly income is the quotient of the median yearly income divided by the number of hours worked per year. Table 1 displays the calculation process.

**Table 1**  
**Median Hourly Income, Folsom, California**

<b>1999 US Census Bureau Estimate</b>	<b>\$73,175</b>
<b>2005 GDP Implicit Price Deflator</b> 1999 GDP Implicit Price Deflator	<b>112.527</b> 98.43
<b>Income Adjustment Factor</b> <b>(112.527/98.43)</b>	<b>1.143</b>
<b>Estimated 2005 Income</b>	<b>\$83,655</b>
<b>Number of Hours Worked Per Year</b> (8 hours/day * 260 working days/year)	<b>2,080</b>
<b>Median Hourly Income, Folsom City</b>	<b>\$40.22</b>

## Motorized Traffic Volume

Traffic volume determines the magnitude of the situation – the number of cars that would be affected by permanent closure of Folsom Dam Road. The magnitude of the cars affected by the closure of the Folsom Dam Road are not limited to only those vehicles that would normally cross the road. Additional impacts will be felt on other surface roads

during the normal workweek as most of the 18,000 vehicles that daily cross the Folsom Dam Road commingle with other traffic creating traffic delays through the regional traffic system. The SACMET model was used to analyze the delays and additional travel distances felt throughout the regional area as a result of diverting Folsom Dam Road traffic upon the current transportation system. The regional delays and added distance were calculated using the SACMET model and appear in the Alternative Evaluation section of this report. The following discussion focuses on profiles of those vehicles that cross the Folsom Dam Road daily.

Folsom Dam Road is currently a two-way road that provides access through the proposed project area. As part of a traffic study done by the City of Folsom to assess the impact on neighboring roadways arterial roadway traffic counts were collected. Estimated average weekday traffic volumes for the year 2002 were 18,000 on the fully used Folsom Dam Road.

Motorized traffic volume was separated by peak hour volume and non-peak hour volume, mainly because the length of delays associated with peak hours and non-peak hours would be different. Review of a Traffic Impact Study for Construction of Flood-Control Improvements to Folsom Dam, dated November 12, 1999 and the 2000 Sacramento Area Household Survey published by the Sacramento Area Council of Governments dated November 2000 was used for purposes of deriving peak load volume.

Based on the above studies and discussions with local traffic specialists, it was determined that weekday peak hours occur typically from 6:00 to 9:00 a.m. and 3:00 to 6:00 p.m. (a total of 6 hours each day). Based on the weekday number of peak hours, a weighted average number of daily peak hours was calculated and determined to be approximately 4.3 hours.  $(\text{Weighted Ave Peak hours} = (6 \text{ hrs/day} \times 5 \text{ days}) / 7 \text{ days/week})$  Table 2 displays the peak hour and non-peak hour volume of cars on Folsom Dam Road.

**Table 2**  
**Peak hour and Non-Peak Hour Traffic Volumes**  
**Folsom Dam Road**  
**Without Restrictions**

	<b>Number of Hours (Weighted Average)</b>	<b>Total Vehicles Per Day <sup>13</sup></b>
<b>Peak Hours</b>	4.3	<b>4,973</b>
<b>Non- Peak Hours</b>	19.7	<b>13,027</b>
<b>Total Average Daily Traffic (ADT) *</b>		<b>18,000</b>

\* Total Average Daily Traffic was supplied by the 2005 SACMET Travel Demand Model, 1999.

Impacts on total regional traffic patterns vary depending upon the alternatives considered. The regional traffic impacts will be analyzed using the same peak\non-peak relationship (hourly weighted average) as is presented above in Table 3.

### **Motorized Trip Purpose**

The analysis organized motorized trip purpose into four types: work, social/recreation, other (including personal business), and vacation. Due to the impracticality of conducting intercept surveys (which would entail stopping cars on roads leading to the Folsom Dam Road and asking the drivers what their trip purpose was), information from past documents, several field observations, general guidance from the Folsom City Department of Transportation knowledgeable of the study area, and the 2000 Sacramento Area Household Travel Study Final Report dated November 2000 were used to estimate the percentages of peak and non-peak hour volume for the four trip purposes. For non-peak hours, it is estimated that 10% of the vehicles travel for work purposes, 30% for

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<sup>13</sup> Peak total vehicles per day was estimated at slightly less than 40 percent of the average daily traffic based on local traffic studies.  $(( 38.7\% \times 18,000 \times 5 \text{ days}) / 7 \text{ days})$

social/recreation purposes, 50% for other (personal business) purposes, and 10% for vacation purposes. For peak hours, it was estimated that 70% of the vehicles were for work purposes, 10% for social/recreation purposes, 15% for personal business, and 5% for vacation purposes. Table 3 displays the percentage breakdown of trip purpose for peak hours and non-peak hours and display the estimated number of vehicles that would use Folsom Dam Road for each purpose. Alternatives will use the same purpose/traffic relationship when measuring the regional vehicle impacts.

**Table 3  
Percentage Breakdown of Trip Purpose  
Peak and Non-Peak Hours  
Folsom Dam Road  
Without Restrictions  
2002**

<b>Peak Hour</b>	<b>% of Peak Hour Traffic Volume</b>	<b>Daily Vehicles on Folsom Dam Road</b>
<b>Work</b>	70%	3,482
<b>Other</b>	15%	746
<b>Social/Recreation</b>	10%	497
<b>Vacation</b>	5%	248
<b>Total</b>	100%	4,973
<b>Non-Peak Hour</b>	<b>% of Non-Peak Hour Traffic Volume</b>	<b>Daily Vehicles</b>
<b>Work</b>	10%	1,303
<b>Other</b>	50%	6,513
<b>Social/Recreation</b>	30%	3,908
<b>Vacation</b>	10%	1,303
<b>Total</b>	100%	13,027

### **Restricted Use**

Under the Without Project Condition the Folsom Dam Road would be restricted using one basic operational criterion. The road would only be open to traffic during the peak morning and afternoon hours of the work-week. This computes to three hours in the morning and three in the afternoon for a total of six hours. Additionally, physical inspections will be undertaken while the road is open. From received information from the City of Folsom, the capacity of the Folsom Dam Bridge under the inspection criteria

is expected to be 7,200 vehicles per work-day. This capacity, however, is not expected to be met every day due to delays caused by inclement weather and impacts due to traffic congestion caused by lines waiting for inspection.

Further, the road would only be open when the anti-terrorist threat is below levels that are to yet be prescribed by the US Bureau of Reclamation. Periodic closures are expected due to construction and maintenance on the Dam as well as other anti-terrorism considerations that are deemed to be classified in nature. After discussions with Bureau of Reclamation personnel, it is assumed that the Folsom Dam Road, for purposes of this analysis, would be open to traffic approximately six full months out of the year. The SACMET Model was employed to arrive at the estimated vehicle traffic expected to go over Folsom Dam Road with restricted access assumptions. Based upon the recommended constraints, it is estimated that 2,670 vehicles will pass over the Folsom Dam Road each day.

Table 4 provides the breakdown of vehicles that cross during the peak hours of the day.

**Table 4**  
**Percentage Breakdown of Trip Purpose**  
**Peak Hours**  
**Folsom Dam Road**  
**With Restrictions**

<b>Trip Purpose</b>	<b>% of Peak Period Traffic Volume</b>	<b>Daily Vehicles on Folsom Dam Road</b>
<b>Work</b>	70%	1,869
<b>Other</b>	15%	400
<b>Social/Recreation</b>	10%	267
<b>Vacation</b>	5%	134
<b>Total</b>	100%	2,670

### **Length of Delay**

The length of delays (in minutes) associated with non-peak and peak hours of motorized traffic form the basis for determining a significant part of the benefits associated with the various alternatives. The length of delay during non-peak and peak hours was estimated from the SACMET model results by taking the difference between the time expended traveling the detoured route and the time expended traveling the un-detoured route, or project route, at different times of the day (that is, during peak hours of the day and non-peak hours of the day).

Length of delay varies depending upon the traffic congestion encountered during certain periods of the day. For peak hours, the length of delay can be significantly more than is experienced during non-peak times as it takes into account merging and increased traffic congestion on neighboring roadways by assumed users of Folsom Dam Road.

The IWR report referred to previously outlines categories (low, medium, high) of savings of time based on trip length (length of delay) that is experienced. A detour that is prevented during non-peak hours or a detour that is prevented during peak hours could have significant differences in the cost of delay depending upon the category of time lost/saved. See Table 5 below for an illustration of the time savings categories and associated per hour cost of delay.

### **Percent of Household Hourly Income Associated with Various Trip Purposes and Trip Length**

Numerous studies have tried to estimate the value of time saved. The IWR Report mentioned previously recommends that Corps planning studies use the percentages of hourly income associated with various trip purposes and trip length derived by Thomas and Thompson (The Value of Time Saved By Trip Purpose, 1971). Table 5 displays these percentages, along with the corresponding hourly income values specific to this study. The per hour cost of delay is based upon the City of Folsom median hourly household income for 2005.

**Table 5**  
**Value of Time Saved by Trip Length and Purpose**

<b>Low Time Savings (Fewer than 5 minutes)</b>	<b>% of Median Hourly Income</b>	<b>Per Hour Cost of Delay</b>
Work Trips	6.4%	\$2.57
Other Trips	1.3%	\$0.52
Social/Recreation Trips	0.1%	\$0.04
Vacation	75.1%	\$30.21
<b>Medium Time Savings (5 – 15 minutes)</b>		
Work Trips	32.2%	\$12.95
Other Trips	23.1%	\$9.29
Social Recreation Trips	14.5%	\$5.83
Vacation	75.1%	\$30.21
<b>High Time Savings (Greater than 15 minutes)</b>		
Work Trips	53.8%	\$21.64
Other Trips	60.0%	\$24.13
Social/Recreation Trips	64.5%	\$25.93
Vacation	75.1%	\$30.21

## **ALTERNATIVE EVALUATION**

Five alternatives were evaluated in the Main Report. They are briefly described below. A detailed description of the alternatives are provided in Chapter 3 of the Main Report.

### **Alternative 1: No Action Alternative (Future Without-Project Condition)**

The no action alternative is the same as the future without-project conditions described previously in Chapter 3, Future Without-Project Conditions. This alternative serves as the baseline against which the costs, benefits, and effects of the action plans are evaluated.

Under this alternative, the Federal Government would implement the features of the various projects already authorized to increase flood protection along the American River. These already authorized projects include the Common Features Project, Folsom

Dam Modification Project, Folsom Dam Re-operation, Folsom Dam Flood Management Plan Update, and Folsom Dam Raise Project without the temporary or permanent bridge feature.

The Folsom Dam Road would be managed indefinitely as a “restricted access” road (as defined by Reclamation) that would be limited to two-way non-commercial traffic during peak commute hours (6:00 a.m. to 9:00 a.m. and 4:00 p.m. to 7:00 p.m.) on Monday through Friday. All vehicles would be subject to security measures, and periodic road closures would be required for O&M work. Road security costs will be City of Folsom’s responsibility. These costs have been estimated and included in this economic analysis as a benefit of a permanent bridge.

Construction of the Folsom Dam Raise project would close Folsom Dam Road for a period of approximately 12 years. The effects of the temporary closure were identified in the 2002 Chief’s Report for the Folsom Dam Raise project.

### **Alternative 2 – Four-Lane Bridge, Four-Lane Road, Full Intersections**

Intersection of Folsom Dam Road and East Natoma Street. The existing intersection at Folsom Dam Road and East Natoma Street would be reconfigured to accommodate four lanes of traffic flow and improve traffic circulation.

Roadway from Intersection to Bridge. The new four-lane roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to a veer-off point about 1,000 feet south of the Folsom Dam Overlook driveway.

### **Alternative 3 – Four-Lane Bridge, Two-Lane Road, Full Intersections**

The features of Alternative 3 are very similar to Alternative 2 except for (1) the segment of new Folsom Dam Road between the Folsom Dam Overlook to the new bridge over the American River.

### **East Approach**

Roadway from Intersection to Bridge. The new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to about 1,000 feet south of the Folsom Dam Overlook area, and this portion of the roadway would remain as four lanes as described in Alternative 2. However, when the roadway veers to the southwest and extends below the new gated auxiliary spillway and above the CDC facilities, it would transition to a two-lane roadway to the river.

### **Alternative 4 – Four-Lane Bridge, Two-Lane Road, Partial Intersection (EAST)**

Alternative 4 is very similar to Alternative 3 except for the intersection of the new roadway with East Natoma Road.

### **East Approach**

Intersection of Folsom Dam Road and East Natoma Street. A new partial intersection would be constructed to accommodate two lanes of traffic flow. The reconfigured, signaled T-intersection would be constructed across from Briggs Ranch Drive.

### **Alternative 5 – Four-Lane Bridge, Two-Lane Road, Partial Intersections**

Alternative 5 is very similar to Alternative 4 except for (1) the segment of new roadway east and west of the new bridge, (2) striping on the bridge, and (3) the intersection of the new roadway with Folsom-Auburn Road.

### **East Approach**

Roadway from Intersection to Bridge. With Alternative 5, the new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to a veer-off point about 1,000 feet south of the Folsom Dam overlook driveway. Construction of the entire portion of the roadway would be two lanes and would include minimal cut into the existing hillside to provide clearance for the shoulders.

### **Bridge Across American River**

The new bridge would be striped for two lanes of traffic to accommodate the two-lane segments of roadway on the east and west.

### **West Approach**

Roadway from Bridge to Intersection. The new roadway would leave the west abutment of the bridge as a two-lane road.

As shown in the discussion above it is recognized that the alternative formulation process analyzes four with-project alternatives, three of which, alternatives 3, 4, and 5 have two-lanes of traffic at the bridge or abutments. The regional travel demand modeling that was used for the economic analysis was done on a regional scale and is not sensitive enough to show any differences between the alternatives that differ only in terms of intersection improvements. Therefore, the analysis below is limited to quantitatively evaluating two alternatives, alternative 2 and 5, in addition to Alternative 1. There will be a discussion at the end of the analysis that will convey the differences in the alternatives 3, 4, and 5 as deemed necessary by the alternative formulation process.

Therefore, based on the model limitations two alternatives, in addition to the without project condition alternative are analyzed in the following discussion. The two with-project alternatives are 1) a two-lane bridge with partial intersection improvements at the bridge approach intersections, and 2) a four-lane bridge and full intersection improvements at the bridge approach intersections

Traffic Volumes for 2007 were derived by applying annual growth rates to existing volumes of roadway traffic. The annual growth rates were estimated by comparing the 2001 and 2013 traffic projections from a modified version of the SACMET travel

demand model. The modified version used for this study was refined to include local roadway network and land use details to improve the model's forecasting accuracy in the study area.

Surveys were performed to measure travel times for 2004 conditions. A modified version of the SACMET model was adjusted and used to estimate travel times for 2007 no action and with project conditions. The percent increase in daily traffic volumes between the no action and the with-project alternatives were applied to the travel times for the no action alternative to determine travel times for these alternatives for the year 2025.

The SACMET model results used to compute that annual loss (benefits) are indicated below. Three scenarios were modeled for the entire Folsom Sub-area for 2007 and, for each with-project alternative, four scenarios modeled for 2025 and beyond. The 2007 W/O Project assumed that the Folsom Dam Road was closed during the Dam raise. The 2026 W/O Project Condition Partial Access was based on the assumption that restricted access was allowed across the Folsom Dam Road. The 2007 and 2025 w/Induced traffic is recognized and considered as a benefit to the construction of the Folsom Bridge Bypass. It is expected that residential traffic will increase as lower traffic congestion is provided. The 2007 and 2025 w/no induced traffic scenarios were modeled to show the affect that existing traffic would have, absent induced traffic. This was modeled by approximating traffic trips in the w/o project conditions. The partial opening scenario is assumed to occur after the construction on the Folsom Dam Raise is completed for the W/O Project condition. Anticipated completion date is 2025 and it is expected that approximately 3,700 vehicles will cross a 4-lane bridge each work-week day during peak hours from 2026 through 2057 for the W/O Project condition. A 2-lane bridge, representing alternatives 3, 4, and 5 is expected to provide significantly less capacity during peak hours.

For the W/O Project condition, security costs are assumed to be incurred beginning in 2026 with the restricted public access on the Folsom Dam Road. Surveillance equipment and installation is expected to cost approximately \$2 million. Annual labor and operation, maintenance and administration is estimated by the city of Folsom Public Works Department at \$1,583,000 annually. These costs are expected to begin in 2026. The annualized cost of installation of equipment and labor and administration is \$602,982.

**Table 6A**  
**Folsom Bridge Bypass**  
**Daily Vehicle Trips –Summary for 2007 and 2025 Conditions**  
**Folsom Sub-area of Modified SACMET V.01 Model (5)**

Scenario	Work-Week AM and PM Peak Period	Ave Daily Work Week Off- Peak	Ave Daily Week-end Trips (3)	Computed Total Daily Trips (4)
2007 W/O Project	327,100	384,500	422,950	629,129
2007 W/ 2-Lane Induced Traffic	329,200	385,800	424,380	631,966
2007 W/2- Lane No Induced Traffic	328,400	384,800	423,280	630,366
2007 W/ 4-Lane Induced Traffic (1)	329,100	386,500	425,150	632,614
2007 W/ 4-Lane No Induced Traffic	328,300	384,800	423,280	630,294
2025 W/ O Project	424,700	500,400	550,440	818,054
2026 W/O Partial Access(2)	425,000	500,400	550,440	818,269
2025 W/ 2-Lane Induced Traffic	426,300	502,000	552,200	820,843
2025 W/2- Lane No Induced Traffic	425,600	501,000	551,100	819,314
2025 W/ 4 Lane Induced Traffic (1)	425,900	502,200	552,420	820,763
2025 W/ 4 Lane No Induced Traffic	425,200	501,000	551,100	819,029

- B. Peak Hours of travel included a 3-hour period for both AM and PM totaling 6 hours for each workday.
- 2) After completion of Dam Construction Efforts the Dam Bridge is assumed to be open to limited traffic subject to GWOT and scheduled maintenance.
  - 3) Week-end use is computed based on a portion of workweek off-peak traffic
  - 4) Daily trips are computed for a 365 day average, considering both work week and week-end trips (For example: 2007 W/O Project Computed Total Daily Trips =  $[(327,100 + 384,500) \times 5] + (422,950) \times 2 / 7$ )
  - 5) The Folsom SACMET Model results are indicated in the columns titled “Work-Week AM and PM” and “Work Week Off-Peak”

**Table 6B**  
**Folsom Bridge Bypass**  
**Daily Vehicle Miles Traveled –Summary for 2007 and 2025 Conditions**  
**Folsom Sub-area of Modified SACMET V.01 Model (5)**

Scenario	Work- Week AM and PM Peak Period	Ave Daily Work Week Off-Peak	Ave Daily Week-end Miles (3)	Computed Total Daily Miles (4)
2007 W/O Project	1,407,400	1,638,000	1,801,800	2,690,086
2007 W/ 2-Lane Induced Traffic	1,424,500	1,649,600	1,814,560	2,714,231
2007 W/2- Lane No Induced Traffic	1,403,800	1,626,900	1,789,590	2,676,097
2007 W/ 4-Lane Induced Traffic (1)	1,424,300	1,654,300	1,819,730	2,718,923
2007 W/ 4-Lane No Induced Traffic	1,403,600	1,626,900	1,789,590	2,675,954
2025 W/ O Project	1,822,400	2,121,600	2,333,760	3,483,931
2026 W/O Partial Access(2)	1,818,300	2,121,600	2,333,760	3,481,003
2025 W/ 2-Lane Induced Traffic	1,832,500	2,129,500	2,342,450	3,499,271
2025 W/2- Lane No Induced Traffic	1,814,600	2,108,900	2,319,790	3,465,297
2025 W/ 4-Lane Induced Traffic (1)	1,832,700	2,133,100	2,346,410	3,503,117
2025 W/ 4-Lane No Induced Traffic	1,814,800	2,108,900	2,319,790	3,465,440

- 1) Peak Miles of travel included a 3-hour period for both AM and PM
- 2) After completion of Dam Construction Efforts the Dam Bridge is assumed to be open to limited traffic subject to GWOT and scheduled maintenance.
- 3) Week-end use is computed based on a portion of workweek off-peak traffic
- 4) Daily trips are computed for a 365 day average, considering both work week and week-end miles traveled.
- 5) The Folsom SACMET Model results are indicated in the columns titled “Work-Week AM and PM” and “Work Week Off-Peak”

**Table 6C**  
**Folsom Bridge Bypass**  
**Daily Vehicle Hours Traveled –Summary for 2007 and 2025 Conditions**  
**Folsom Sub-area of Modified SACMET V.01 Model (4)**

Scenario	Work-Week AM and PM Peak Period	Work Week Off- Peak	Computed Daily Peak Period (3)	Computed Daily Non-Peak Period (3)
2007 W/O Project	49,800	43,500	35,571	39,357
2007 W/ 2-Lane Induced Traffic (5)	50,100	43,800	-	-
2007 W/2- Lane No Induced Traffic	49,200	42,900	35,143	38,946
2007 W/ 4-Lane Induced Traffic (1)	49,100	43,900	-	-
2007 W/ 4-Lane No Induced Traffic	48,200	43,000	34,428	38,946
2025 W/ O Project	62,700	56,200	44,786	50,848
2026 W/O Partial Access(2)	62,100	56,200	44,357	50,848
2025 W/ 2-Lane Induced Traffic (5)	62,800	56,500	-	-
2025 W/2- Lane No Induced Traffic	61,600	55,800	44,000	50,540
2025 W/ 4-Lane Induced Traffic (1)	62,600	56,500	-	-
2025 W/ 4-Lane No Induced Traffic	61,400	55,800	43,857	50,540

- 1) Peak Hours of travel included a 3-hour period for both AM and PM
- 2) After completion of Dam Construction Efforts the Dam Bridge is assumed to be open to limited traffic subject to GWOT and scheduled maintenance under the w/o scenario.
- 3) Daily trips are computed for a 365 day average, considering both work week and week-end hours of travel.
- 4) The Folsom SACMET Model results are indicated in the columns titled “Work-Week AM and PM” and “Work Week Off-Peak”
- 5) Induced Daily Peak and Non-Peak Traffic was not computed as it is not necessary in the analysis of induced benefits.

### **Without Project Condition**

This description of the assumed without-project condition serves as the baseline against which alternative plans will be evaluated to determine their effectiveness and effects that would result from them. This is the condition against which effects to the environment are determined in the accompanying Supplemental EIS/EIR as well as the economic benefits of alternative bridges are derived.

Under the without-project condition, the Folsom Dam Road, closed for security reasons since February 28, 2003, is to be assumed re-opened in the fall of 2006 and would be managed by Reclamation indefinitely as a “restricted access” road that would be limited to two-way traffic during the peak commute hours (6:00 a.m. to 9:00 a.m. and 4:00 p.m.

to 7:00 p.m.) on Monday through Friday. Access of some types of vehicles would be restricted, such as commercial vehicles, trucks, trailers, and recreational vehicles. With the restricted access of Folsom Dam Road, the following results are anticipated:

Costs and implementation of security measures and road maintenance work would be the responsibility of the City of Folsom, with possible permitting and toll fees imposed by the City.

Additional short- and long-term direct and indirect costs for a restricted access road would be incurred by the City, regional commuters, local businesses, Reclamation, and other agencies.

The restricted access would increasingly divert and change traffic patterns to other City streets and affect business traffic and commerce in other areas.

The City and region would have a progressively inadequate northern connection route across the river, even if another crossing farther down river (Oak Avenue) is constructed.

Pedestrians and bicyclists would not have a safe and convenient access connection to both sides of the river near the Folsom Reservoir.

New and continuing Homeland Security measures would require additional long-term costs for the dam.

It is assumed that Folsom Dam Road would be closed during the construction of the Folsom Dam Raise project.

The Folsom City Bikeway Master Plan includes recommendations to enhance local existing bicycle facilities, providing consistent access to bike lanes on roads, the completion of trails, and the connection of existing bike trails to local and regional roads and facilities (City of Folsom, 2002). It is assumed that these projects would be completed as funds become available. None of the identified improvements or enhancements have a direct effect on the bridge project.

The following set of objectives was created through the planning process and provides a specific direction for the formulation of alternatives:

Provide a bridge to mitigate regional traffic impacts caused by the closing of Folsom Dam Road during construction activities.

Provide a bridge within the Folsom Dam Road area of influence that addresses current traffic demands and needs of the City of Folsom and the surrounding region.

Provide a bridge/roadway within the Folsom Dam Road area of influence that addresses future traffic demands and needs of the City of Folsom and the surrounding region and provides a long-term solution to Homeland Security concerns.

Provide a bridge within the Folsom Dam Road area of influence to increase recreational opportunities in the City of Folsom and surrounding areas.

### **Current Situation -**

The Folsom Dam Road is assumed to carry an average of 2,670 vehicles per day on the 2-lane road. Alternative routes are assumed to be used through the central part of the City of Folsom for all other traffic. The impacts resulting from this routing however has been minimized by a traffic-calming program implemented by the City of Folsom. The City of Folsom developed a “traffic calming” program for the historic district in response to the traffic pattern changes due to the restricted access criteria. Available data were used to evaluate roadway segment and intersection operations for conditions before implementation of the city’s traffic calming program.

The traffic-calming program included selected roadway closures, turn restrictions, and neighborhood signage. Prior to the program, vehicles would travel on neighborhood streets such as Scott Street and Sutter Street to avoid congestion on Riley Street. The traffic calming program place a diverter at the Sutter/Scott Street intersection, which allows only right turns in the southbound direction. Additional signage and modifications were made which dramatically decreased the peak-hour traffic on Coloma Street.

The SACMET model was used in the computation of traffic commute hours by peak and non-peak criteria. The data from the SACMET model was adjusted to reflect and average daily volume for computational purposes. Table 7 and 8 reflects the average daily number of hours by trip purpose for the current situation or without project condition.

**Table 7**  
**Time by Trip Purpose**  
**Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	24,900	365	1.4
<b>Other</b>	5,336	365	1
<b>Social/Rec.</b>	3,557	365	1
<b>Vacation</b>	1,778	365	1
<b>Total<sup>14</sup></b>	35,571		

**Table 8**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	3,936	365	1.4
<b>Other</b>	19,678	365	1
<b>Social/Rec.</b>	11,807	365	1
<b>Vacation</b>	3,936	365	1
<b>Total<sup>2</sup></b>	39,357		

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<sup>14</sup> Total is taken from Table 6C 2007 W/O Project

<sup>2</sup> Total is taken from Table 6C 2007 W/O Project

### 2025 to 2057 Conditions –

Traffic is expected to increase on all study roadways by 2025 except for Folsom Dam Road due to limited access requirement due to security restrictions and scheduled construction on the Dam ( Raise or Modifications) anticipated through 2025. The without project condition is expected to change at the end of 2025 when the assumed construction effort on the Dam is completed. Limited access is expected to resume at a rate of 3,737 vehicles per day across Folsom Dam Road. This resumption of traffic across Folsom Dam Road is considered in the computation of the average annual benefits for the period 2026 through 2057. For purposes of this analysis, the growth of traffic in the Folsom sub-area is assumed to remain fixed after 2025 due to the subjectivity of projecting growth beyond 20 years.

**Table 9A**  
**Time by Trip Purpose**  
**Peak Hours**  
**2025 –No Folsom Road Traffic**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	31,350	365	1.4
<b>Other</b>	6,718	365	1
<b>Social/Rec.</b>	4,479	365	1
<b>Vacation</b>	2,239	365	1
<b>Total<sup>3</sup></b>	44,786		

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<sup>3</sup> Total is taken from Table 6C 2025 W/O Project

**Table 9B**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2025 –No Folsom Road Traffic**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	5,085	365	1.4
<b>Other</b>	25,424	365	1
<b>Social/Rec.</b>	15,254	365	1
<b>Vacation</b>	5,085	365	1
<b>Total<sup>3</sup></b>	50,848		

**Table 10A**  
**Time by Trip Purpose**  
**Peak Hours**  
**2026 – 2057 –Limited Folsom Road Traffic**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	31,050	365	1.4
<b>Other</b>	6,653	365	1
<b>Social/Rec.</b>	4,436	365	1
<b>Vacation</b>	2,218	365	1
<b>Total<sup>4</sup></b>	44,357		

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<sup>4</sup> Total is taken from Table 6C 2026 W/O Partial Access

**Table 10B**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2026-2057 –Limited Folsom Road Traffic**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	5,085	365	1.4
<b>Other</b>	25,424	365	1
<b>Social/Rec.</b>	15,254	365	1
<b>Vacation</b>	5,085	365	1
<b>Total<sup>4</sup></b>	50,848		

**With Project Condition – 2-Lane**

**Current Situation –**

A bridge located immediately downstream of the Folsom Dam Road would provide an alternative traffic option for the vehicles that currently assumed to use the Folsom Dam Road. This 2-lane bridge would not be restricted due to security measures and have the capability of servicing 950 vehicles per hour per lane or 1,900 vehicles per hour in total. Based upon recent traffic studies, the permanent bridge is expected to accommodate over 15,000 vehicles trips per day.

**Table 11**  
**Time by Trip Purpose**  
**Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	24,600	365	1.4
<b>Other</b>	5,272	365	1
<b>Social/Rec.</b>	3,514	365	1
<b>Vacation</b>	1,757	365	1
<b>Total<sup>5</sup></b>	35,143		

**Table 12**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	3,895	365	1.4
<b>Other</b>	19,473	365	1
<b>Social/Rec.</b>	11,683	365	1
<b>Vacation</b>	3,895	365	1
<b>Total<sup>5</sup></b>	38,946		

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<sup>5</sup> Total is taken from Table 6C 2007 2-Lane W/No Induced Traffic

<sup>5</sup> Total is taken from Table 6C 2007 2-Lane W/No Induced Traffic

## 2025 to 2057 Conditions –

By 2025 the average daily traffic in the Folsom sub-area is expected to increase by 188,029 trips (819,029-630,294)<sup>6</sup>. Traffic on all study roadways is expected to increase as population in the Folsom area increases from 2007 to 2025, but is assumed to remain constant after 2025 as projections beyond 2025 become very subjective.

**Table13**  
**Time by Trip Purpose**  
**Peak Hours**  
**2025**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	30,800	365	1.4
<b>Other</b>	6,600	365	1
<b>Social/Rec.</b>	4,400	365	1
<b>Vacation</b>	2,200	365	1
<b>Total<sup>7</sup></b>	44,000		

**Table 14**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2025**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	5,054	365	1.4
<b>Other</b>	25,270	365	1
<b>Social/Rec.</b>	15,162	365	1
<b>Vacation</b>	5,054	365	1
<b>Total<sup>7</sup></b>	50,540		

<sup>6</sup> See Table 6A

<sup>7</sup> Total is taken from Table 6C 2025 2-Lane W/No Induced Traffic

## Savings in Travel Delay Computations

Tables 15 and 16 display the difference in Folsom area sub-regional travel time between the without project condition and the 2-lane project condition for peak and non-peak hours for the year 2007. These tables use the previously calculated figures illustrated in Tables 7, 8, 11, and 12 for the computation of the 2007 annual losses. Table 17 summarizes the 2007 losses.

The traffic change within the peak period for 2007 between the with and without-project condition is a total of 428 hours. Consultation with local businesses and commuters indicate that detours from the Dam Road add at least an additional 10 to 15 minutes during the peak period of travel during the work-week. Recognizing that an estimated 1,002 daily trips are directly affected by the lengthy detour, the change in hours can be computed on the 1,002 vehicles that would normally cross the 2-lane bridge. The residual hours are those hours gained by sub-area commuters that were given the option of using the Bridge. They are considered as incidental and are calculated based on a low amount of time saved (See Table 6 for definition).

Using the “Medium Time Savings” from Table 5 (5 to 15 minute savings) the direct users of the Folsom Dam Road would save a total of 167 hours daily (1,002 trips x 10 minutes / 60 minutes per hour). The residual savings, 261 hours, (428 - 167) is deemed to average less than 5 minutes change per vehicle and are computed on the “Low Time Savings” criteria.

**Table 15 – With Project  
Value of Travel Time Delays by Trip Purpose  
Peak Period  
2007  
(Table 7 – Table 11)**

### Peak Hours (2007)

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	24,900	24,600	300
Other	5,336	5,272	64
Social/Recreational	3,557	3,514	43
Vacation	1,778	1,757	21
<b>Total Hours</b>	<b>35,571</b>	<b>35,143</b>	<b>428</b>

**Savings in Travel Delay Cost Computations – Peak Hours (2007)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
	<b>TOTAL<sup>8</sup></b>	<b>428</b>				
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	183	365	1.4	2.57	\$240,328
	<b>Other</b>	39	365	1	.52	\$7,402
	<b>Social/Rec.</b>	26	365	1	.04	\$380
	<b>Vacation</b>	13	365	1	30.21	\$143,346
	<b>Total</b>	<b>261</b>				\$391,456
<b>Medium (5 - 15 minutes)</b>	<b>Work</b>	117	365	1.4	12.95	\$774,242
	<b>Other</b>	25	365	1	9.29	\$84,771
	<b>Social/Rec.</b>	17	365	1	5.83	\$36,175
	<b>Vacation</b>	8	365	1	30.21	\$88,213
	<b>Total</b>	<b>167</b>				\$983,401
<b>Total Savings in Transportation Costs (Peak Hours)</b>						<b>\$1,374,857</b>

Since the Dam Road is assumed to be closed during non-peak hours in the without project condition benefits derived from the use of the Folsom Bridge is based on the sub-area average and computed at the “Low Time Saved” rate.

<sup>8</sup> Table 7 total (35,571) – Table 11 total (35,143) = 428. The total is allocated by trip purpose and length of time saved.

**Table 16**  
**Value of Travel Time Delays by Trip Purpose**  
**Non-Peak Hours**  
**2007**  
**(Table 8 – Table 12)**

**Non-Peak Hours (2007)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	3,936	3,895	41
Other	19,678	19,473	205
Social/Recreational	11,807	11,683	124
Vacation	3,936	3,895	41
<b>Total Hours</b>	<b>39,357</b>	<b>38,946</b>	<b>411</b>

**Savings in Transportation Cost Computations – Non-Peak Hours (2007)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	41	365	1.4	2.57	\$53,844
	<b>Other</b>	206	365	1	.52	\$39,099
	<b>Social/Rec.</b>	123	365	1	.04	\$1,796
	<b>Vacation</b>	41	365	1	30.21	\$452,093
	<b>Total<sup>9</sup></b>	411				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$546,832</b>

<sup>9</sup> Table 8 total (39,357) – Table 12 total (38,946) = 411.

**Table 17**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**2007**

<b>Total Peak Hour Losses – Low Time</b>	<b>Total Annual Losses</b>
<b>Total Peak Hour Losses – Medium Time</b>	\$391,456
<b>Total Peak Hours</b>	<u>\$983,401</u>
	<b>\$1,374,857</b>
<b>Total Non-Peak Hour Losses</b>	<b>\$546,832</b>
<b>Total Losses</b>	<b>\$1,921,689</b>

b. Value of extra miles driven due to detours

In addition to the extra time required by the detour routes, extra miles driven would also be incurred. There is an associated cost to driving longer distances because of the increased wear and tear that is placed on a vehicle. To calculate these additional costs, it was necessary to determine the cost per mile to operate an automobile. The 2003 variable cost rate of \$.21 was updated due to the increase in fuel experienced from 2003 to 2005. The updated value of \$.253 was used for this analysis and multiplied by the total number of extra miles traveled by all automobiles affected by the detour in a year. Based on map measurements, the proposed detour route estimated by the Traffic Impact Study increased the average daily vehicle miles of travel by 14,132 miles. Table 18 displays the calculation of losses incurred due to extra miles driven.

**Table 18**  
**Value of Losses Due to Extra Miles Driven**  
**2007**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Driven<sup>10</sup></b>	<b>Annual Losses</b>
0.253	365	13,989	<b>\$1,291,814</b>

**2025 to 2057 Conditions**

Tables 19 through 21 reflect the difference in Folsom area sub-regional travel time between the without project condition and the project condition for peak and non-peak

<sup>10</sup> See Table 6B (2007 W/O Project) – (2007 2-Lane w/No Induced Traffic)

hours for the year 2025. These tables use the previously calculated figures illustrated in Tables 9A, 9B, 13, and 14 for the computation of the annual losses expected to occur in 2025. A total of 929 hours are expected to be saved between the without project (Table 9A) and the with project condition (Table 13). The 2,670 vehicles using the Folsom Dam Road are estimated to save 445 hours daily with the remaining 484 hours (929 – 445) considered as incidental savings to the remaining area residents during the peak commute period.

Table 22 through 24 summarizes the 2026 through 2057 losses based on the without project condition of re-opening the Folsom Dam Road to limited or restricted traffic. Accordingly, all benefits are received by the general area commuters as there is no specific benefits during this period for the users of the Folsom Dam Road.

**Table 19 – Project with No Folsom Dam Traffic**  
**Value of Travel Time Delays by Trip Purpose**  
**Peak Hours**  
**2025**  
**(Table 9A – Table 13)**

**Peak Hours (2025**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	31,350	30,800	550
Other	6,718	6,600	118
Social/Recreational	4,479	4,400	79
Vacation	2,239	2,200	39
<b>Total Hours</b>	<b>44,786</b>	<b>44,000</b>	<b>786</b>

**Savings in Travel Delay Costs –Peak Hours (2025)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
	<b>TOTAL<sup>11</sup></b>	<b>786</b>				
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	286	365	1.4	2.57	\$375,595
	<b>Other</b>	61	365	1	.52	\$11,578
	<b>Social/Rec.</b>	41	365	1	.04	\$599
	<b>Vacation</b>	20	365	1	30.21	\$220,533
	<b>Total</b>	<b>408</b>				\$608,305
<b>Medium (5 - 15 minutes)</b>	<b>Work</b>	264	365	1.4	12.95	\$1,747,007
	<b>Other</b>	57	365	1	9.29	\$193,278
	<b>Social/Rec.</b>	38	365	1	5.83	\$80,862
	<b>Vacation</b>	19	365	1	30.21	\$209,506
	<b>Total</b>	<b>378</b>				\$2,230,653
<b>Total Savings in Transportation Costs (Peak Hours)</b>						<b>\$2,838,958</b>

**Table 20 – 2 Lane Project with No Folsom Dam Traffic  
Value of Travel Time Delays by Trip Purpose  
Non-Peak Hours  
2025  
(Table 9B – Table 14)**

**Non-Peak Hours (2025)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	5,085	5,054	31
Other	25,424	25,270	154
Social/Recreational	15,254	15,162	92
Vacation	5,085	5,054	31
<b>Total Hours</b>	<b>50,848</b>	<b>50,540</b>	<b>308</b>

<sup>11</sup> See Table 9A (44,786) – Table 13 (44,000) = 786.

**Savings in Transportation Cost Computations – Non-Peak Hours (2025)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer that 5 minutes)</b>	<b>Work</b>	31	365	1.4	2.57	\$40,711
	<b>Other</b>	154	365	1	.52	\$29,229
	<b>Social/Rec.</b>	92	365	1	.04	\$1,343
	<b>Vacation</b>	31	365	1	30.21	\$341,826
	<b>Total<sup>12</sup></b>	308				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$413,109</b>

**Table 21**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**2025 – No Folsom Dam Traffic**

<b>Total Peak Period Losses –Low</b>	<b>Total Annual Losses</b>
<b>Total Peak Hour Losses – Medium Time</b>	\$608,305
<b>Total Peak Hour Losses</b>	<u>\$2,230,653</u>
	<b>\$2,838,958</b>
<b>Total Non-Peak Hour Losses</b>	<b>\$413,109</b>
<b>Total Losses</b>	<b>\$3,252,067</b>

<sup>12</sup> See Table 9B (50,848) – Table 14 (50,540) = 308.

**Table 22 – 2 Lane With Project Compared to W/O Project  
Having Restricted Dam Road Access  
Value of Travel Time Delays by Trip Purpose  
Peak Period  
2026 – 2057  
(Table 10A – Table 13)**

**Peak Hours (2026 - 2057)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	31,050	30,800	250
Other	6,653	6,600	53
Social/Recreational	4,436	4,400	36
Vacation	2,218	2,200	18
<b>Total Hours</b>	<b>44,357</b>	<b>44,000</b>	<b>357</b>

**Savings in Transportation Costs – Peak Hours (20026-2057)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	250	365	1.4	2.57	\$328,318
	<b>Other</b>	53	365	1	.52	\$10,059
	<b>Social/Rec.</b>	36	365	1	.04	\$526
	<b>Vacation</b>	18	365	1	30.21	\$198,480
	<b>Total<sup>13</sup></b>	357				
<b>Savings in Transportation Cost (Peak Hours)</b>						<b>\$537,383</b>

<sup>13</sup> Table 10A (44,357) – Table 13 (44,000) = 357.

**Table 23 – 2-Lane With Project Compared to W/O Project  
Having Restricted Dam Road Access  
Value of Travel Time Delays by Trip Purpose  
Non-Peak Hours  
2026 - 2057  
(Table 10B – Table 14)**

**Non-Peak Hours (2026-2057)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	5,085	5,054	31
Other	25,424	25,270	154
Social/Recreational	15,254	15,162	92
Vacation	5,085	5,054	31
<b>Total Hours</b>	<b>50,848</b>	<b>50,540</b>	<b>308</b>

**Savings in Transportation Costs – Non-Peak Hours (2026-2057)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	31	365	1.4	2.57	\$40,711
	<b>Other</b>	154	365	1	.52	\$29,229
	<b>Social/Rec.</b>	92	365	1	.04	\$1,343
	<b>Vacation</b>	31	365	1	30.21	\$341,826
	<b>Total<sup>14</sup></b>	308				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$413,109</b>

<sup>14</sup> See Table 10B (50,848) – Table 14 (50,540) = 308.

**Table 24**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**Limited Folsom Dam Traffic Comparison**  
**2026-2057**

<b>Total Peak Hour Losses</b>	<b>Total Annual Losses</b>
<b>Total Non-Peak Hour Losses</b>	\$537,383
	\$413,109
<b>Total Losses</b>	<b>\$950,492</b>

b. Value of extra miles driven due to detours

In addition to the extra time required by the detour routes, extra miles driven would also be incurred. There is an associated cost to driving longer distances because of the increased wear and tear that is placed on a vehicle. To calculate these additional costs, it was necessary to determine the cost per mile to operate an automobile. The 2003 variable cost rate of \$.21 was updated due to the increase in fuel experienced from 2003 to 2004. The updated value of \$.253 was used for this analysis and multiplied by the total number of extra miles traveled by all automobiles affected by the detour in a year. Based on map measurements, the proposed detour route estimated by the Traffic Impact Study increased the average daily vehicle miles of travel by 18,491 miles (3,483,931 miles- 3,465,440 miles) from Table 6B when compared to no traffic being allowed across the Dam Road. Table 25 displays the calculation of losses incurred due to extra miles driven. By the end of 2025 the Dam Road is assumed to be opened to limited traffic during peak hours of the work-week. The daily losses due to driving extra miles comparing the with project condition with the limited access scenario are based on 15,563 miles (3,481,003 miles – 3,465,440 miles) per year for the period 2026 – 2057. Table 26 displays the calculation of losses incurred during 2026 – 2057.

**Table 25**  
**Value of Losses Due to Extra Miles Driven**  
**2025**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Driven<sup>15</sup></b>	<b>Annual Losses</b>
0.253	365	18,634	<b>\$1,720,757</b>

<sup>15</sup> See Table 6B (3,483,931 – 3,465,297)

**Table 26**  
**Value of Losses Due to Extra Miles Driven**  
**Limited Folsom Dam Traffic**  
**2026-2057**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Drive<sup>16</sup></b>	<b>Annual Losses</b>
0.253	365	15,706	<b>\$1,450,371</b>

## **2. Value of induced traffic resulting from decreased roadway congestion**

Traffic is expected to increase as a result of lower congestion as a result of the permanent bridge. Residents are expected to take additional trips due to convenience in getting across town and not having to contend with long delays due to congestion. The induced traffic was estimated using the SACMET modeling technique and was built into the model for the period 2008 through 2025. The induced traffic estimate was truncated at 2025 but was carried out to the end of the analysis period 2057.

Only the induced trips were analyzed in this section as the affected traffic was evaluated in the previous section. It is expected that the induced traffic would be predominately social and recreational in purpose. Accordingly, for this analysis all induced traffic is expected to be associated with recreation or social events.

The process of determining the beneficial value of induced traffic use is challenging. Recognizing that the social or recreational value options are the main driver in the induced trip analysis, a proxy recreational value was determined to be appropriate for determining its beneficial use. The rationale for this proxy recreational value appears below.

Visitors to the USACE Sacramento District's water based recreational areas in 1999 were estimated by the District to have spent an average of \$16.50 per visit. Using the GDP Implicit Price Deflator, the 2005 estimated expenditures per person is \$18.00 per visit. General recreation unit day value computations represent the net willingness to pay, or consumer surplus, over and above the actual expenditures to recreate. Using the unit day value concept, the consumer surplus of recreational use varies from a low of \$3.00 to over \$30 for specialized recreation. As a point of reference, bicycling on the Folsom River Bridge has a computed value of \$5.27 and is included in the recreational analysis section of the main report. Assuming a base expenditure of \$18 per visitor and a conservative estimate of consumer surplus at \$3.00, the estimated consumer surplus for recreation is computed to be  $(\$3/\$18)$  16.7 percent. Using the 16.7 percent as an estimate of the consumer surplus for general motorized recreation we can place a value on the induced traffic by multiplying the estimated expenditures of the induced motorist's travel cost by a factor of 16.7 percent to arrive at an estimated benefit of having reduced congestion on the City's roadway.

<sup>16</sup> See Table 6B (3,481,003 – 3,465,297)

An estimated total of induced miles associated with low congestion was computed for 2007 and 2025 by subtracting the total number miles including the induced miles from the total sub-area miles estimated by the SACMET model constraining trips to the without project condition. By constraining the number of trips to the without project condition, the induced miles could be computed and evaluated.

In the year 2007, the induced miles were computed to be 38,277 miles daily (2,714,231 – 2,675,954). By multiplying these miles by the average cost per mile (\$.253) and then multiplying the result by the estimated consumer surplus (.167) the estimated Net Willingness to Pay (NWTP) per day is computed. The results of these computations are \$1,617.24 NWTP for 2007 and \$1,429.39 NWTD per day for 2025 - 2057. Annually, the NWTP for 2007 computes to \$590,293, and for 2025 -2057 the computation is \$521,727.

### **Current Situation – 4-Lane**

A bridge located immediately downstream of the Folsom Dam Road would provide an alternative traffic option for the vehicles that currently assumed to use the Folsom Dam Road. This 4-lane bridge would not be restricted due to security measures and have the capability of servicing 950 vehicles per hour per lane or 3,800 vehicles per hour in total. Based upon recent traffic studies, the permanent bridge is expected to accommodate over 30,000 vehicles trips per day.

**Table 27**  
**Time by Trip Purpose**  
**Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	24,100	365	1.4
<b>Other</b>	5,164	365	1
<b>Social/Rec.</b>	3,443	365	1
<b>Vacation</b>	1,721	365	1
<b>Total<sup>17</sup></b>	34,428		

<sup>17</sup> Total is taken from Table 6C 2007 4-Lane W/No Induced Benefits

**Table 28**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2007**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	3,895	365	1.4
<b>Other</b>	19,473	365	1
<b>Social/Rec.</b>	11,683	365	1
<b>Vacation</b>	3,895	365	1
<b>Total<sup>18</sup></b>	38,946		

**2025 to 2057 Conditions –**

By 2025 the average daily traffic in the Folsom sub-area is expected to increase by 188,029 trips (819,029-630,294)<sup>19</sup>. Traffic on all study roadways is expected to increase as population in the Folsom area increases from 2007 to 2025, but is assumed to remain constant after 2025 as projections beyond 2025 become very subjective.

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<sup>18</sup> Total is taken from Table 6C 4-Land W/No Induced Benefits

<sup>19</sup> See Table 6A

**Table 29**  
**Time by Trip Purpose**  
**Peak Hours**  
**2025**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	30,700	365	1.4
<b>Other</b>	6,578	365	1
<b>Social/Rec.</b>	4,386	365	1
<b>Vacation</b>	2,193	365	1
<b>Total<sup>20</sup></b>	43,857		

**Table 30**  
**Time by Trip Purpose**  
**Non-Peak Hours**  
**2025**

<b>Trip Purpose</b>	<b>Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>
<b>Work</b>	5,054	365	1.4
<b>Other</b>	25,270	365	1
<b>Social/Rec.</b>	15,162	365	1
<b>Vacation</b>	5,054	365	1
<b>Total<sup>21</sup></b>	50,540		

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<sup>20</sup> Total is taken from Table 6C 4-Lane 2025 W/No Induced Traffic Peak Hours

<sup>21</sup> Total is taken from Table 6C 4-Lane 2025 W/No Induced Traffic Non-Peak Hours

## Savings in Travel Delay Computations

Tables 31 and 32 display the difference in Folsom area sub-regional travel time between the without project condition and the project condition for peak and non-peak hours for the year 2007. These tables use the previously calculated figures illustrated in Tables 7, 8, 27, and 28 for the computation of the 2007 annual losses. Table 33 summarizes the 2007 losses.

The traffic change within the peak period for 2007 between the with and without project condition is a total of 1,143 hours. Consultation with local businesses and commuters indicate that detours from the Dam Road add at least an additional 10 to 15 minutes during the peak period of travel during the work-week. Recognizing that the estimated 2,670 daily trips are directly affected by the lengthy detour, the change in hours can be computed on the 2,670 vehicles normally crossing the bridge. The residual hours are those hours gained by sub-area commuters that were given the option of using the Bridge. They are considered as incidental and are calculated based on a low amount of time saved (See Table 6 for definition).

Using the “Medium Time Savings” from Table 5 (5 to 15 minute savings) the direct users of the Folsom Dam Road would save a total of 445 hours daily (2,670 trips x 10 minutes / 60 minutes per hour). The residual savings, 698 hours, (1,143- 445) is deemed to average less than 5 minutes change per vehicle and are computed on the “Low Time Savings” criteria.

**Table 31 – 4-Lane With-Project  
Value of Travel Time Delays by Trip Purpose  
Peak Period  
2007  
(Table 7 – Table 27)**

### Peak Hours (2007)

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	24,900	24,100	800
Other	5,336	5,164	172
Social/Recreational	3,557	3,443	114
Vacation	1,778	1,721	57
<b>Total Hours</b>	<b>35,571</b>	<b>34,428</b>	<b>1143</b>

**Savings in Travel Delay Cost Computations – Peak Hours (2007)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
	<b>TOTAL<sup>22</sup></b>	<b>1,143</b>				
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	488	365	1.4	2.57	\$640,876
	<b>Other</b>	105	365	1	.52	\$19,929
	<b>Social/Rec.</b>	70	365	1	.04	\$1,022
	<b>Vacation</b>	35	365	1	30.21	\$385,933
	<b>Total</b>	<b>698</b>				<b>\$1,047,760</b>
<b>Medium (5 - 15 minutes)</b>	<b>Work</b>	312	365	1.4	12.95	\$2,064,644
	<b>Other</b>	67	365	1	9.29	\$227,187
	<b>Social/Rec.</b>	44	365	1	5.83	\$93,630
	<b>Vacation</b>	22	365	1	30.21	\$242,586
	<b>Total</b>	<b>445</b>				<b>\$2,628,047</b>
<b>Total Savings in Transportation Costs (Peak Hours)</b>						<b>\$3,675,807</b>

Since the Dam Road is assumed to be closed during non-peak hours in the without project condition benefits derived from the use of the Folsom Bridge is based on the sub-area average and computed at the “Low Time Saved” rate.

<sup>22</sup> Table 7 (35,571) – Table 27 (34,428) = 1,143. The total is allocated by trip purpose and length of time saved.

**Table 32**  
**Value of Travel Time Delays by Trip Purpose**  
**Non-Peak Hours**  
**2007**  
**(Table 8 – Table 28)**

**Non-Peak Hours (2007)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	3,936	3,895	41
Other	19,678	19,473	205
Social/Recreational	11,807	11,683	124
Vacation	3,936	3,895	41
<b>Total Hours</b>	<b>39,357</b>	<b>38,946</b>	<b>411</b>

**Savings in Transportation Cost Computations – Non-Peak Hours (2007)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	41	365	1.4	2.57	\$53,844
	<b>Other</b>	206	365	1	.52	\$39,099
	<b>Social/Rec.</b>	123	365	1	.04	\$1,796
	<b>Vacation</b>	41	365	1	30.21	\$452,093
	<b>Total Hrs <sup>23</sup></b>	411				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$546,832</b>

<sup>23</sup> Table 8 (39,357) – Table 28 (38,946) = 411

**Table 33**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**2007**

<b>Total Peak Hour Losses – Low Time</b>	<b>Total Annual Losses</b> \$1,047,760
<b>Total Peak Hour Losses – Medium Time</b>	<u>\$2,628,047</u>
<b>Total Peak Hours Losses</b>	<b>\$3,675,807</b>
<b>Total Non-Peak Hour Losses</b>	<b>\$546,832</b>
<b>Total Losses</b>	<b>\$4,222,639</b>

b. Value of extra miles driven due to detours

In addition to the extra time required by the detour routes, extra miles driven would also be incurred. There is an associated cost to driving longer distances because of the increased wear and tear that is placed on a vehicle. To calculate these additional costs, it was necessary to determine the cost per mile to operate an automobile. The 2003 variable cost rate of \$.21 was updated due to the increase in fuel experienced from 2003 to 2004. The updated value of \$.253 was used for this analysis and multiplied by the total number of extra miles traveled by all automobiles affected by the detour in a year. Based on map measurements, the proposed detour route estimated by the Traffic Impact Study increased the average daily vehicle miles of travel by 14,132 miles. Table 34 displays the calculation of losses incurred due to extra miles driven.

**Table 34**  
**Value of Losses Due to Extra Miles Driven**  
**2007**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Driven<sup>24</sup></b>	<b>Annual Losses</b>
0.253	365	14,132	<b>\$1,305,020</b>

**2025 to 2057 Conditions**

Tables 35 through 37 reflect the difference in Folsom area sub-regional travel time between the without project condition and the project condition for peak and non-peak

<sup>24</sup> See Table 6B (2007 W/O Project) – (2007 4-Lane W/No Induced Traffic)

hours for the year 2025. These tables use the previously calculated figures illustrated in Tables 9A, 9B, 29, and 30 for the computation of the annual losses expected to occur in 2025. A total of 929 hours are expected to be saved between the without project (Table 9A) and the with project condition (Table 29). The 2,670 vehicles using the Folsom Dam Road are estimated to save 445 hours daily with the remaining 484 hours (929 – 445) considered as incidental savings to the remaining area residents during the peak commute period.

Table 38 through 40 summarizes the 2026 through 2057 losses based on the without project condition of re-opening the Folsom Dam Road to limited or restricted traffic. Accordingly, all benefits are received by the general area commuters as there is no specific benefits during this period for the users of the Folsom Dam Road.

**Table 35 – 4-Lane Project with No Folsom Dam Traffic**  
**Value of Travel Time Delays by Trip Purpose**  
**Peak Hours**  
**2025**  
**(Table 9A – Table 29)**

**Peak Hours (2025**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	31,530	30,700	830
Other	6,718	6,578	140
Social/Recreational	4,479	4,386	93
Vacation	2,239	2,193	46
<b>Total Hours</b>	<b>44,786</b>	<b>43,857</b>	<b>929</b>

**Savings in Travel Costs – Peak Hours (2025)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
	<b>TOTAL<sup>25</sup></b>	<b>929</b>				
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	339	365	1.4	2.57	\$445,199
	<b>Other</b>	73	365	1	.52	\$13,855
	<b>Social/Rec.</b>	48	365	1	.04	\$700
	<b>Vacation</b>	24	365	1	30.21	\$264,640
	<b>Total</b>	<b>484</b>				\$724,394
<b>Medium (5 - 15 minutes)</b>	<b>Work</b>	312	365	1.4	12.95	\$2,064,644
	<b>Other</b>	67	365	1	9.29	\$227,187
	<b>Social/Rec.</b>	44	365	1	5.83	\$93,630
	<b>Vacation</b>	22	365	1	30.21	\$242,586
	<b>Total</b>	<b>445</b>				\$2,628,047
<b>Total Savings in Transportation Costs (Peak Hours)</b>						<b>\$3,352,441</b>

**Table 36 – 4-Lane Project with No Folsom Dam Traffic  
Value of Travel Time Delays by Trip Purpose  
Non-Peak Hours  
2025  
(Table 9B – Table 30)**

**Non-Peak Hours (2025)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	5,085	5,054	31
Other	25,424	25,270	154
Social/Recreational	15,254	15,162	92
Vacation	5,085	5,054	31
<b>Total Hours</b>	<b>50,848</b>	<b>50,540</b>	<b>308</b>

<sup>25</sup> See Table 9A (44,786) – Table 29 (43,857) = 929. The total is allocated by trip purpose and length of time saved.

**Savings in Transportation Cost Computations-Non-Peak Hours (2025)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	31	365	1.4	2.57	\$40,711
	<b>Other</b>	154	365	1	.52	\$29,229
	<b>Social/Rec.</b>	92	365	1	.04	\$1,343
	<b>Vacation</b>	31	365	1	30.21	\$341,826
	<b>Total Hrs<sup>26</sup></b>	308				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$411,766</b>

**Table 37**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**2025 – No Folsom Dam Traffic**

<b>Total Peak Period Losses –Low</b>	<b>Total Annual Losses</b>
<b>Total Peak Hour Losses – Medium Time</b>	\$724,394
<b>Total Peak Hour Losses</b>	<u>\$2,628,047</u>
	<b>\$3,352,441</b>
<b>Total Non-Peak Hour Losses</b>	<b>\$411,766</b>
<b>Total Losses</b>	<b>\$3,764,207</b>

<sup>26</sup> See Table 9B (50,848) – Table 30 (50,540) = 308.

**Table 38 – 4-Lane With Project Compared to W/O Project  
Having Restricted Dam Road Access  
Value of Travel Time Delays by Trip Purpose  
Peak Period  
2026 – 2057  
(Table 10A – Table 29)**

**Peak Hours (2026-2057)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	31,050	30,700	350
Other	6,653	6,578	75
Social/Recreational	4,436	4,386	50
Vacation	2,218	2,193	25
<b>Total Hours</b>	<b>44,357</b>	<b>43,857</b>	<b>500</b>

**Savings in Transportation Costs – Peak Hours (2026-2057)**

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	350	365	1.4	2.57	\$459,644
	<b>Other</b>	75	365	1	.52	\$14,235
	<b>Social/Rec.</b>	50	365	1	.04	\$730
	<b>Vacation</b>	25	365	1	30.21	\$275,666
	<b>Total<sup>27</sup></b>	500				
<b>Savings in Transportation Costs (Peak Hours)</b>						<b>\$750,275</b>

<sup>27</sup> Table 10A (44,357) – Table 29 (43,857) = 500.

**Table 39 – 4-Lane With Project Compared to W/O Project  
Having Restricted Dam Road Access  
Value of Travel Time Delays by Trip Purpose  
Non-Peak Hours  
2026 - 2057  
(Table 10B – Table 30)**

**Non-Peak Hours (2026-2057)**

<b>Trip Purpose</b>	<b>Number of Hours Without Project</b>	<b>Number of Hours With Project</b>	<b>Reduction in Number of Hours</b>
Work	5,085	5,054	31
Other	25,424	25,270	154
Social/Recreational	15,254	15,162	92
Vacation	5,085	5,054	31
<b>Total Hours</b>	<b>50,848</b>	<b>50,540</b>	<b>308</b>

<b>Length of Time Saved</b>	<b>Trip Purpose</b>	<b>Change in Number of Hours</b>	<b>Number of Days</b>	<b>Average Number of Passengers Per Vehicle (Work Purpose)</b>	<b>Value of Delay Per Hour</b>	<b>Annual Losses</b>
<b>Low (Fewer than 5 minutes)</b>	<b>Work</b>	31	365	1.4	2.57	\$40,711
	<b>Other</b>	154	365	1	.52	\$29,229
	<b>Social/Rec.</b>	92	365	1	.04	\$1,343
	<b>Vacation</b>	31	365	1	30.21	\$341,826
	<b>Total<sup>28</sup></b>	308				
<b>Savings in Transportation Costs (Non-Peak Hours)</b>						<b>\$413,109</b>

<sup>28</sup> Table 10B (50,848) – Table 30 (50,540) = 308.

**Table 40**  
**Total Value of Travel Time Delays**  
**Peak and Non-Peak Hours**  
**Limited Folsom Dam Traffic Comparison**  
**2026-2057**

<b>Total Peak Hour Losses</b>	<b>Total Annual Losses</b>
<b>Total Non-Peak Hour Losses</b>	\$750,275
	\$413,109
<b>Total Losses</b>	<b>\$1,163,384</b>

b. Value of extra miles driven due to detours

In addition to the extra time required by the detour routes, extra miles driven would also be incurred. There is an associated cost to driving longer distances because of the increased wear and tear that is placed on a vehicle. To calculate these additional costs, it was necessary to determine the cost per mile to operate an automobile. The 2003 variable cost rate of \$.21 was updated due to the increase in fuel experienced from 2003 to 2004. The updated value of \$.253 was used for this analysis and multiplied by the total number of extra miles traveled by all automobiles affected by the detour in a year. Based on map measurements, the proposed detour route estimated by the Traffic Impact Study increased the average daily vehicle miles of travel by 18,491 miles (3,483,931 miles- 3,465,440 miles) from Table 6B when compared to no traffic being allowed across the Dam Road. Table 41 displays the calculation of losses incurred due to extra miles driven. By the end of 2025 the Dam Road is assumed to be opened to limited traffic during peak hours of the work-week. The daily losses due to driving extra miles comparing the with project condition with the limited access scenario are based on 15,563 miles (3,481,003 miles – 3,465,440 miles) per year for the period 2026 – 2057. Table 42 displays the calculation of losses incurred during 2026 – 2057.

**Table 41**  
**Value of Losses Due to Extra Miles Driven**  
**2025**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Driven<sup>29</sup></b>	<b>Annual Losses</b>
0.253	365	18,491	<b>\$1,707,551</b>

<sup>29</sup> See Table 6B (3,483,931 – 3,465,440).

**Table 42**  
**Value of Losses Due to Extra Miles Driven**  
**Limited Folsom Dam Traffic**  
**2026-2057**

<b>Cost Per Mile to Operate a Vehicle</b>	<b>Number of Days</b>	<b>Daily Extra Miles Drive <sup>30</sup></b>	<b>Annual Losses</b>
0.253	365	15,563	<b>\$1,437,165</b>

## **2. Value of induced traffic resulting from decreased roadway congestion**

Traffic is expected to increase as a result of lower congestion as a result of the permanent bridge. Residents are expected to take additional trips due to convenience in getting across town and not having to contend with long delays due to congestion. The induced traffic was estimated using the SACMET modeling technique and was built into the model for the period 2008 through 2025. The induced traffic estimate was truncated at 2025 but was carried out to the end of the analysis period 2057.

Only the induced trips were analyzed in this section as the affected traffic was evaluated in the previous section. It is expected that the induced traffic would be predominately social and recreational in purpose. Accordingly, for this analysis all induced traffic is expected to be associated with recreation or social events.

The process of determining the beneficial value of induced traffic use is challenging. Recognizing that the social or recreational value options are the main driver in the induced trip analysis, a proxy recreational value was determined to be appropriate for determining its beneficial use. The rationale for this proxy recreational value appears below.

Visitors to the USACE Sacramento District's water based recreational areas in 1999 were estimated by the District to have spent an average of \$16.50 per visit. Using the GDP Implicit Price Deflator, the 2004 estimated expenditures per person is \$18.00 per visit. General recreation unit day value computations represent the net willingness to pay, or consumer surplus, over and above the actual expenditures to recreate. Using the unit day value concept, the consumer surplus of recreational use varies from a low of \$3.00 to over \$30 for specialized recreation. As a point of reference, bicycling on the Folsom River Bridge has a computed value of \$5.27 and is included in the recreational analysis section of the main report. Assuming a base expenditure of \$18 per visitor and a conservative estimate of consumer surplus at \$3.00, the estimated consumer surplus for recreation is computed to be  $(\$3/\$18)$  16.7 percent. Using the 16.7 percent as an estimate of the consumer surplus for general motorized recreation we can place a value on the induced traffic by multiplying the estimated expenditures of the induced motorist's travel cost by a factor of 16.7 percent to arrive at an estimated benefit of having reduced congestion on the City's roadway.

<sup>30</sup> See Table 6B (3,481,003 – 3,465,440).

An estimated total of induced miles associated with low congestion was computed for 2007 and 2025 by subtracting the total number miles including the induced miles from the total sub-area miles estimated by the SACMET model constraining trips to the without project condition. By constraining the number of trips to the without project condition, the induced miles could be computed and evaluated.

In the year 2007, the induced miles were computed to be 42,969 miles daily (2,718,923 – 2,675,954).<sup>31</sup> By multiplying these miles by the average cost per mile (\$.253) and then multiplying the result by the estimated consumer surplus (.167) the estimated Net Willingness to Pay (NWTP) per day is computed. The results of these computations are \$1,815.48 NWTP for 2007 and \$1,591.89 NWTP per day for 2025 - 2057. Annually, the NWTP for 2007 computes to \$662,650, and for 2025 -2057 the computation is \$581,040.

### SUMMARY OF DAMAGES PREVENTED

A summary of the total potential losses, or damages prevented, that could occur is presented in Table 43

**Table 43**  
**Summary of Damages Prevented**  
**2007**

	<b>2-Lane</b>	<b>4-Lane</b>
Value of Travel Time Delays (Folsom Dam Road) <sup>32</sup>	\$1,921,689	\$4,222,639
Value of Extra Miles Driven <sup>33</sup>	\$1,291,814	\$1,305,020
Induced traffic benefits	\$ 588,088	\$ 662,650
<b>Total average damages prevented</b>	<b>\$ 3,801,591</b>	<b>\$ 6,190,309</b>

### 2025 No Dam Road Traffic

	<b>2-Lane</b>	<b>4-Lane</b>
Value of Travel Time Delays (Folsom Dam Road) <sup>34</sup>	\$3,252,067	\$3,764,207
Value of Extra Miles Driven <sup>35</sup>	\$ 1,720,757	\$ 1,707,551
Induced traffic benefits	\$ 523,936	\$ 581,040
<b>Total average damages prevented</b>	<b>\$ 5,496,760</b>	<b>\$ 6,052,798</b>

<sup>31</sup> See Table 6B .

<sup>32</sup> See Table 17 and Table 33

<sup>33</sup> See Table 18 and Table 34

<sup>34</sup> See Table 21 and Table 37

<sup>35</sup> See Table 25 and Table 41

### 2026 - 2057 Limited Dam Road Traffic

	2-Lane	4-Lane
Value of Travel Time Delays (Folsom Dam Road) <sup>36</sup>	\$950,492	\$1,163,384
Value of Extra Miles Driven <sup>37</sup>	\$1, 450,371	\$1, 437,165
Induced traffic benefits	\$ 523,936	\$ 581,040
Annualized Savings of Dam Road Security	\$ 602,982	\$ 602,982
<b>Total average damages prevented</b>	<b>\$ 3,527,781</b>	<b>\$ 3,784,571</b>

### AVERAGE ANNUAL BENEFIT ANALYSIS

The National Economic Development (NED) plan is the one that maximizes net benefits. Net benefits are the difference between the average annual benefits and the average annual costs.

Under the “without” project condition, the losses summarized in the previous section would be incurred should the Folsom Dam Road be closed during construction on the Dam. If a project were to be built, experiencing the closure of the Folsom Dam Road, ultimately the losses described above would be prevented. The prevention of these losses achieves those savings (benefits) associated with a project. These benefits are then annualized to reflect the average annual benefits accruable to a project over the 50-year period that the Folsom Dam Bridge is under construction.

The annual average benefit computation uses the annual damages indicated in the previously stated analysis. The annual damages prevented through the construction of the 2-lane alternative in 2007 (\$3,801,591), is incrementally changed to reflect an annual damage prevented in 2025 of \$5,496,760. The annual damages prevented are then changed to reflect the reopening of the Folsom Dam Road and the associated benefits derived thereof (\$3,527,781,). These data were computed using excel spreadsheet and annualizing the benefits using a 5 1/8 percent discount rate for 50 years. Combined, the total average annual damage prevented is **\$4,410,000.**

The annual average benefit computation uses the annual damages indicated in the previously stated analysis. The annual damages prevented through the construction of the 4-lane alternative in 2007 (\$6,190,309), is incrementally changed to reflect an annual damage prevented in 2025 of \$6,052,798. The annual damages prevented are then changed to reflect the reopening of the Folsom Dam Road and the associated benefits derived thereof (\$3,784,571). These data were computed using excel spreadsheet and

<sup>36</sup> See Table 24 and Table 40

<sup>37</sup> See Table 26 and Table 42.

annualizing the benefits using a 5 1/8 percent discount rate for 50 years. Combined, the total average annual damage prevented is **\$5,650,000.**

### Estimated Annual Damages for 2-Lane Bridge Alternatives

Year	CRF	Damages	PW Damages
		(\$ million)	(\$ million)
2007	0	1	\$3.80
2008	1	0.951248514	\$3.90
2009	2	0.904873735	\$3.99
2010	3	0.860759795	\$4.08
2011	4	0.818796476	\$4.18
2012	5	0.778878931	\$4.27
2013	6	0.740907425	\$4.37
2014	7	0.704787087	\$4.46
2015	8	0.670427669	\$4.55
2016	9	0.637743324	\$4.64
2017	10	0.606652389	\$4.74
2018	11	0.577077183	\$4.84
2019	12	0.548943813	\$4.93
2020	13	0.522181986	\$5.03
2021	14	0.496724838	\$5.12
2022	15	0.472508764	\$5.21
2023	16	0.449473259	\$5.30
2024	17	0.42756077	\$5.40
2025	18	0.406716547	\$5.50
2026	19	0.386888511	\$3.53
2027	20	0.368027121	\$3.53
2028	21	0.350085252	\$3.53
2029	22	0.333018075	\$3.53
2030	23	0.316782949	\$3.53
2031	24	0.301339309	\$3.53
2032	25	0.28664857	\$3.53
2033	26	0.272674026	\$3.53
2034	27	0.259380762	\$3.53
2035	28	0.246735565	\$3.53
2036	29	0.234706839	\$3.53
2037	30	0.223264532	\$3.53
2038	31	0.212380054	\$3.53
2039	32	0.202026211	\$3.53
2040	33	0.192177133	\$3.53
2041	34	0.182808212	\$3.53
2042	35	0.17389604	\$3.53
2043	36	0.165418349	\$3.53
2044	37	0.157353959	\$3.53
2045	38	0.14968272	\$3.53
2046	39	0.142385465	\$3.53
2047	40	0.135443962	\$3.53
2048	41	0.128840867	\$3.53
2049	42	0.122559683	\$3.53
2050	43	0.116584717	\$3.53
2051	44	0.110901038	\$3.53
2052	45	0.105494448	\$3.53
2053	46	0.100351437	\$3.53
2054	47	0.095459155	\$3.53
2055	48	0.090805379	\$3.53
2056	49	0.086378482	\$3.53
2057	50	0.082167403	\$3.53

Total

\$79.04

**EAD**

**\$4.41**

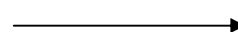
### Estimated Annual Damages for 4-Lane Bridge (Alternative 2)

Year		CRF	Damages	PW Damages
2007	0	1	6.19	6.19
2008	1	0.951248514	6.18	5.88
2009	2	0.904873735	6.18	5.59
2010	3	0.860759795	6.17	5.31
2011	4	0.818796476	6.16	5.04
2012	5	0.778878931	6.15	4.79
2013	6	0.740907425	6.14	4.55
2014	7	0.704787087	6.14	4.33
2015	8	0.670427669	6.13	4.11
2016	9	0.637743324	6.12	3.90
2017	10	0.606652389	6.11	3.71
2018	11	0.577077183	6.11	3.53
2019	12	0.548943813	6.10	3.35
2020	13	0.522181986	6.09	3.18
2021	14	0.496724838	6.08	3.02
2022	15	0.472508764	6.08	2.87
2023	16	0.449473259	6.07	2.73
2024	17	0.42756077	6.06	2.59
2025	18	0.406716547	6.05	2.46
2026	19	0.386888511	3.78	1.46
2027	20	0.368027121	3.78	1.39
2028	21	0.350085252	3.78	1.32
2029	22	0.333018075	3.78	1.26
2030	23	0.316782949	3.78	1.20
2031	24	0.301339309	3.78	1.14
2032	25	0.28664857	3.78	1.08
2033	26	0.272674026	3.78	1.03
2034	27	0.259380762	3.78	0.98
2035	28	0.246735565	3.78	0.93
2036	29	0.234706839	3.78	0.89
2037	30	0.223264532	3.78	0.84
2038	31	0.212380054	3.78	0.80
2039	32	0.202026211	3.78	0.76
2040	33	0.192177133	3.78	0.73
2041	34	0.182808212	3.78	0.69
2042	35	0.17389604	3.78	0.66
2043	36	0.165418349	3.78	0.63
2044	37	0.157353959	3.78	0.60
2045	38	0.14968272	3.78	0.57
2046	39	0.142385465	3.78	0.54
2047	40	0.135443962	3.78	0.51
2048	41	0.128840867	3.78	0.49
2049	42	0.122559683	3.78	0.46
2050	43	0.116584717	3.78	0.44
2051	44	0.110901038	3.78	0.42
2052	45	0.105494448	3.78	0.40
2053	46	0.100351437	3.78	0.38
2054	47	0.095459155	3.78	0.36
2055	48	0.090805379	3.78	0.34
2056	49	0.086378482	3.78	0.33
2057	50	0.082167403	3.78	0.31

Total

101.09

**EAD**



**5.65**

# **Equivalent Annual Costs of Security Measures**

Year	CRF	Costs	PW Costs
2007	0	1	\$0
2008	1	0.951248514	\$0
2009	2	0.904873735	\$0
2010	3	0.860759795	\$0
2011	4	0.818796476	\$0
2012	5	0.778878931	\$0
2013	6	0.740907425	\$0
2014	7	0.704787087	\$0
2015	8	0.670427669	\$0
2016	9	0.637743324	\$0
2017	10	0.606652389	\$0
2018	11	0.577077183	\$0
2019	12	0.548943813	\$0
2020	13	0.522181986	\$0
2021	14	0.496724838	\$0
2022	15	0.472508764	\$0
2023	16	0.449473259	\$0
2024	17	0.42756077	\$0
2025	18	0.406716547	\$0
2026	19	0.386888511	\$3,583,000
2027	20	0.368027121	\$1,583,000
2028	21	0.350085252	\$1,583,000
2029	22	0.333018075	\$1,583,000
2030	23	0.316782949	\$1,583,000
2031	24	0.301339309	\$1,583,000
2032	25	0.28664857	\$1,583,000
2033	26	0.272674026	\$1,583,000
2034	27	0.259380762	\$1,583,000
2035	28	0.246735565	\$1,583,000
2036	29	0.234706839	\$1,583,000
2037	30	0.223264532	\$1,583,000
2038	31	0.212380054	\$1,583,000
2039	32	0.202026211	\$1,583,000
2040	33	0.192177133	\$1,583,000
2041	34	0.182808212	\$1,583,000
2042	35	0.17389604	\$1,583,000
2043	36	0.165418349	\$1,583,000
2044	37	0.157353959	\$1,583,000
2045	38	0.14968272	\$1,583,000
2046	39	0.142385465	\$1,583,000
2047	40	0.135443962	\$1,583,000
2048	41	0.128840867	\$1,583,000
2049	42	0.122559683	\$1,583,000
2050	43	0.116584717	\$1,583,000
2051	44	0.110901038	\$1,583,000
2052	45	0.105494448	\$1,583,000
2053	46	0.100351437	\$1,583,000
2054	47	0.095459155	\$1,583,000
2055	48	0.090805379	\$1,583,000
2056	49	0.086378482	\$1,583,000
2057	50	0.082167403	\$1,583,000

← Surveillance Equipment

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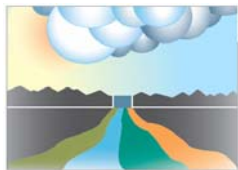
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\$10,798,388

**Equivalent Ann Costs**

**\$602,982**



American River Watershed Project

## Post Authorization Decision Document

# **American River Watershed Project**

## **Folsom Dam Raise, Folsom Bridge**

## **Appendix C: Real Estate Plan**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

## **REAL ESTATE PLAN FOLSOM DAM RAISE, BRIDGE COMPONENT**

### **1. Introduction.**

This Plan is prepared in accordance with ER 405-1-12, 12-18, Real Estate Plan for the **FOLSOM DAM RAISE, BRIDGE COMPONENT PROJECT** located in the City of Folsom, Sacramento County, California.

The non-Federal sponsor for the Folsom Bridge Project is the City of Folsom, California and the Sacramento Flood Control Agency (SAFCA), as an LPCA partner.

### **2. Authority.**

The Folsom Bridge Project was authorized by Congress in the Energy and Water Development Appropriations Act of 2004 (Public Law 108-137):

The Secretary is authorized to accept funds from State and local governments and other Federal agencies for the purpose of constructing a permanent bridge instead of the temporary bridge described in the recommended plan....

The Secretary, in cooperation with appropriate non-Federal interests, shall immediately commence appropriate studies for, and the design of, a permanent bridge (including an evaluation of potential impacts of bridge construction on traffic patterns and identification of alternatives for mitigating such impacts) and...shall proceed to construction of the bridge as soon as practicable....

The study authority for the American River Watershed Investigation was provided under the Flood Control Act of 1962 (Public Law 87-874), and specific direction was provided in Section 566 of the Water Resources Development Act of 1999 (Public Law 106-53). The relevant text of these public laws is included in the 2002 SEIS/SEIR.

Previous studies include the Supplemental Information Report for the American River Project, completed in March of 1996, which supplemented the American River Watershed Investigation of April 1991; The Second Addendum to the Supplemental Information Report, Lower American River WRDA 1999 Common Features; the Information Paper, American River Watershed, California, August 1999; the Additional Information – Folsom Dam Flood Control Storage & Downstream Levees, January 2000 Report and the Second Addendum to the Supplemental Information Report (SIR), completed in February of 2001. Real Estate requirements for the other elements of the dam raise project remain as identified in previous reports

### 3. **Project Location.**

The project area is located in the City of Folsom and Sacramento County in northern California approximately 26.5 miles northeast of the City of Sacramento. The project area encompasses about 380 acres and includes the area just below Folsom Dam between the intersections of Folsom Dam Road and East Natoma Street on the east and Folsom Dam Road and Folsom-Auburn Road on the west. The project area extends south to about Inwood Avenue.

Folsom Lake was created in 1955 by the construction of Folsom Dam. The dam is a 340-foot high concrete structure. Its primary functions are for flood control, water storage and electrical power generation. When full, the lake contains approximately 10,000 surface acres of water and over a million acre-feet of water.

### 3. **Project Information.**

In September 2004, Congress authorized the Folsom Dam Raise Project, including authorization of construction of a permanent bridge just downstream of Folsom Dam. This action, which responds to that authorization, would provide a permanent traffic roadway and bridge across the American River. The existing Folsom Dam Road and bridge were closed to public traffic on February 29, 2003, for security reasons.

The feasibility report in support of the Folsom Dam Raise identified a temporary bridge as a component of that raise. This was to mitigate for the closure of the existing dam bridge during the construction of the dam raise (a 15-year period), both as access for the Bureau of Reclamation and local traffic. Subsequent to the preparation of the feasibility study, but prior to the authorization of the dam raise, post 9/11 security measures implemented by the Bureau of Reclamation resulted in the closure of the dam road and bridge which carried a significant traffic load. Congress recognized that the cost of construction and deconstruction of a temporary bridge approached the cost of the construction of a permanent bridge. In recognizing the need for an additional permanent bridge to meet local traffic needs combined with the closure of the existing bridge due to the Bureau of Reclamation's security and safety concerns, Congress authorized the construction of a permanent bridge with the provision that any costs above \$36 million dollars would be funded by the non-Federal cost-share partner or other non-Federal funding.

This authorization presented an opportunity to address both existing traffic needs, anticipated future traffic volumes, and recreation opportunities. Based on this opportunity and the permissive legislation the Corps conducted public meetings and scoping sessions and conducted traffic studies and demographic analysis to assess current and future traffic loads.

#### 4. **Alternative Plans.**

The study, together with findings and public feedback, produced the following five alternative plans. The five plans include combinations of two-lane roadway, four-lane roadway, and partial and full construction at the East Natoma Road and Auburn-Folsom Road intersections.

**Alternative 1:** No Action.

**Alternative 2:** Four-Lane Bridge, Four-Lane Road, Full Intersections.

**Alternative 3:** Four-Lane Bridge, Two-Lane Road, Full Intersections.

**Alternative 4:** Four-Lane Bridge, Two-Lane Road, Partial Intersection (East).

**Alternative 5:** Four-Lane Bridge, Two-Lane Road, Two Partial Intersections.

Each action alternative would provide a new permanent roadway with bike lanes between the Folsom Dam Road intersection at East Natoma Street on the east to the Folsom-Auburn Road on the West, with a new bridge crossing at the American River downstream of Folsom Dam.

The new roadway and bridge would provide unrestricted convenient access to both sides of the river near the Folsom Reservoir. Each alternative would be designed to meet current transportation design and safety standards for a main traffic arterial as defined by the City of Folsom and California Department of Transportation.

Table 4.

<b>Alternatives</b>	<b>Fee Simple Acres</b>	<b>Permanent Road Easement (ROW) Acres</b>	<b>TWAE Acres</b>	<b>Estimated Value</b>
<b>Alternative 1 – No Action</b>	0	0	0	0
<b>Alternative 2</b>	5.85a.c.	44.7 a.c.	23.00 a.c.	\$7,400,000.00
<b>Alternative 3</b>	5.85 a.c.	44.7 a.c.	23 .00a.c.	\$7,400,000.00
<b>Alternative 4</b>	1.7 a.c.	44.7 a.c.	22.78 a.c.	\$3,375,000.00
<b>Alternative 5</b>	1.7 a.c.	33.5 a.c.	22.78 a.c.	\$3,330,000.00

#### 5. **Recommended Plan.**

**Alternative 3 was identified-and selected as the recommended plan for the project and is composed of the following:**

### **East Approach.**

**Roadway from Intersection to Bridge.** The existing intersection at Folsom Dam Road and East Natoma Street would be reconfigured to accommodate four lanes of traffic flow and improve traffic circulation. The new roadway segment from the intersection at East Natoma Street would generally follow the existing Folsom Dam Road alignment to a veer-off point about 1,000 feet south of the Folsom Dam Overlook area. Construction of this portion of the roadway would be four lanes. As the road veers to the southwest and extends below the new, gated auxiliary spillway structure and continues west above the CDC facilities, the road would transition to a two-lane roadway to the river. This portion of the roadway would be a new two-lane roadway with 12-foot-wide lanes and 8-foot-wide shoulders, and designed for traffic traveling at 45 miles per hour. The roadway would cross about 4 acres of CDC property.

**Reclamation and Prison Access Roads.** Construction of the gated auxiliary spillway would convert part of the staging area for the Folsom Dam Modification Project to a concrete structure for outflow management and/or dam safety. The remaining portion of this area would likely be used as a staging area for this project, and an access road would be provided. As a result, no access road would be constructed to provide access to this area. Additionally, a paved left turn pocket, would be included in the design to facilitate future construction of a spur to provide access for maintenance of the spillway.

An intersection with left and right turn lanes would be constructed approximately 500 feet west of the new retaining wall. A short segment of new roadway would be constructed, connecting the new Folsom Dam Road to the existing dam road. This would provide secured access to the Overlook for the staging and to the dam for Reclamation's operations and maintenance activities.

Farther west, an access driveway from the new Folsom Dam Road would be provided to Reclamation and City of Folsom's water control structure. In addition, a non-signalized, intersection would be constructed at the existing access road to allow continued access to CDC's Sacramento-Folsom firing range.

**Bridge Across the American River.** The new Folsom Dam Road would continue west and connect to the east bridge abutment, which would be located 500 feet east of the river. The bridge's orientation would align slightly south to allow the road to connect to Folsom-Auburn Road just south of most of Reclamation facilities.

The new bridge span and concrete abutments would be approximately 935 feet long and be striped for four lanes of traffic. The span would be supported by two piers placed above the mean river water level in the river bank areas below. The bridge span would have an estimated clearance of 180 feet from the river (top of deck to mean river surface).

### **West Approach.**

**Roadway from Bridge to Intersection.** The west bridge abutment would be located 400 feet west of the river. From the abutment, the alignment of the new roadway segment would cross the north side of the existing Reclamation storage yard, a dam service road, the northeast edge of the Lake Point Apartment complex, and south side of the ARWEC facilities, and connect to the existing Folsom-Auburn Road across from the existing driveway to the Auto Spa. This alignment would affect the ARWEC, some existing Reclamation storage and parking, and Lake Point Apartment complex facilities.

A 1,000-foot-long sound wall and landscaping would be constructed between the new roadway and the apartment complex to mitigate sound due to traffic on the new roadway. In addition, a 600-foot-long sound wall would be constructed between the new roadway and Reclamation facilities, likely along the new bike trail.

**Intersection of Folsom Dam Road and Folsom-Auburn Road.** A new intersection would be constructed at the terminus of the new roadway at Folsom-Auburn Road. The new four-way intersection would include the Auto Spa driveway opposite the new roadway segment. The new intersection would consist of two left-turn lanes from southbound Folsom-Auburn Road onto the new roadway, one dedicated southbound lane, and one combination lane for southbound or right turns. Northbound Auburn-Folsom Road would have two dedicated northbound lanes, a right-turn lane onto the new roadway, and a left-turn lane. The existing Folsom-Auburn Road along the Lake Point Apartment complex would need to be widened by 500 feet to add a right turn lane. This new signalized access would require additional right-of-way to allow for a right-hand turn lane. The roadway corridor would consist of the existing bike trail (DPR lands – 0.85 acres) plus additional Federal (36.6 Acres) and private lands owned by an adjacent apartment complex (0.2 Acres), to allow for the necessary width of the corridor to support the roadway and bridge approach.

A new signaled T-intersection and two-lane access road about 1,200 feet northwest of the existing Folsom Dam Road intersection would be constructed for Reclamation use, secured access to their facilities, and possible access to new ARWEC facilities.

**Bicycle/Pedestrian Trails.** A Class II bicycle trail would be constructed to provide continuous access between East Natoma Street and Folsom-Auburn Road as well as additional recreational opportunities for biking and walking. Two new Class II bike trails would extend along the north and south shoulder of the new roadway. These 8-foot-wide trails would be surfaced in asphalt and physically part of the new roadway surface. These trails would be for bicyclists only. The Class II bike trails would connect to the existing trails.

The project area currently has several segments of existing bike trail in the project area. These include (1) Class 1 bike trails on each side of the roadway at the intersection of Briggs Ranch Drive and East Natoma Street and (2) Jedediah Smith bike trail on the

west side of the river. These trails were constructed, and are currently maintained by, the City of Folsom and State Parks. The new Class II bike trail would connect to these existing bike trails, as well as incorporate the segment of trail along the alignment of Folsom Dam Road north of East Natoma Street.

Near the bridge, a new bike trail underpass would be designed and constructed about 800 feet east of the existing Folsom Dam Road intersection with Folsom-Auburn Road. The new bike trail at the bridge would be connected with the realigned trail. In addition, a segment of the existing Jedediah Smith bike trail would be rerouted along the river slope edge under the new bridge abutment and reconnected to the existing trail.

Along Folsom-Auburn Road, the existing segment of bike trail near the new T-intersection north of Reclamation facilities would be relocated to facilitate public access to the ARWEC and State Parks facilities.

#### 6. **Real Estate Requirements.**

For real estate requirements in excess of **pre-existing project lands**, the non-Federal Sponsor will acquire the minimum interests in real estate to support the construction and subsequent operation and maintenance of the bridge and roadway. The following standard estates are identified as required for the project:

- **Fee Simple**
- **Road Easements (ROW)**  
**Required for the new roadway.**
- **Temporary Work Area Easements (TWAE)**  
**Required during construction to transport equipment and supplies as well as for staging areas.**

In addition to the above standard estates, a County Permit issued to the non-Federal sponsor (City of Folsom) is required to support mitigation lands.

No additional lands are required to store borrow material.

For work on existing Federal Project lands, Rights-of-Entry will be negotiated with the Federal agency that has control and custody of the project. Upon completion of the bridge the non-Federal cost share partner will be required to obtain an easement from the Bureau of Reclamation to support their ownership of the bridge and their operation and maintenance responsibilities.

The project real estate requirements detailing estates and areas are described below. The value is based on a Real Estate Gross Appraisal Estimate Report as the Planning Level Estimate by the Appraisal Branch of the Sacramento District Real Estate Division with a date of value of September 2005. An amended Gross Estimate draft

report was completed in February 2006. The amended report reflects the refinement of the road right-of-way that will take a portion of the Lake Point Apartment complex, and information that was provided by the Environmental Resources Branch regarding the sound wall that will mitigate noise from the new road. The estimate of potential severance damages has been revised significantly and is the principal difference in the value estimate in this report and the previous report.

**Table 6 Real Estate Requirements**

<b>Estate</b>	<b>Ownerships</b>	<b>Acres</b>	<b>Estimated Value</b>
<b>Fee Simple</b>	4	5.85	\$1,604,508
<b>Permanent Road Easements (ROW)</b>	2	44.70	\$247,500
<b>Temporary Work Area Easement (TWAE)</b>	3	23.00	\$65,263

## 7. Mitigation.

Mitigation requirements for the bridge would be accommodated within the American River Parkway. U.S. Fish and Wild Life Service views the impacts of the many portions of the Common Features Flood Control Projects (Common Features, Folsom Dam Modifications, and the Folsom Dam Raise) to have accumulative impacts whereby “the whole is greater then the sum of the parts”. For this reason mitigation requirements are being determined on a cumulative project basis. To deal with these cumulative impacts a mitigation site along the American River has been identified.

The mitigation site is to be permitted by the County of Sacramento, Parks and Recreation Department to Sacramento Area Flood Control Agency (SAFCA). This site will be used as a mitigation site for American River Flood Control Projects as a whole. SAFCA, an LPCA signatory to the common features projects is a member of the joint powers agencies of which both the County of Sacramento and City of Sacramento are members.

Below are the costs for each of the alternatives for environmental mitigation lands. Costs are based on an \$8000.00 administrative fee per acre. There is no cost for land since the mitigation site is located on the County’s American River Parkway.

<b>Alternative #2</b>	<b>Alternative #3</b>	<b>Alternative #4</b>	<b>Alternative #5</b>
\$618,840	\$606,280	\$583,720	\$571,160

## **8. Federal Lands.**

There are four (4) parcels in the project area (APN 227-0250-002, 071-0010-001, 071-0010-005 and 071-0040-001), owned in Fee by the United States of America. Approximately 53.8 acres will be used for the project. 36.6 acres will be used for Permanent Road Easements (PRE) and 17.2 acres for Temporary Work Area Easements (TWAE).

The following improvements on the Bureau's administrative compound will be affected: two of the twenty-seven buildings will need to be removed and four modular buildings will need to be relocated, as they are located in the take area. The two buildings are a small wood-frame storage shed and a concrete tilt-up restroom. The modular buildings, to be relocated, are newer structures in average to good condition that were moved to the project area recently. Their relocation is considered a construction cost, not a real estate cost.

## **9. Sponsor Owned Lands.**

The non-Federal Sponsor, (City of Folsom) owns one (1) property within the project boundaries. The property, (APN 071-0010-010), is owned in Fee by the City of Folsom. Approximately 0.4 acres will be used for the project.

## **10. Public Owned Lands.**

The State of California (Folsom Prison) owns one (1) property within the project boundaries. The property, (APN 071-0010-010), is owned in Fee by the State of California. Approximately 12.9 acres will be acquired in Road Easements. The State of California, Department of Parks and Recreation owns one (1) property that is part of the bicycle path (APN 227-0222-008). Approximately 0.85 acres will be used for the project.

## **11. Private Ownership.**

There are two (2) privately owned parcels owned by two (2) different owners. From these privately owned parcels, approximately 4.6 acres will be acquired in Fee and .3 acres in Temporary Work Area Easements.

## **12. Navigational Servitude.**

There are no lands within the project area that are subject to the applications of navigational servitude.

## **13. Public Law 91-646 Relocations And Benefits.**

For those elements addressed in this Real Estate Plan no Public Law 91-646 relocations or benefits have been identified nor are any anticipated as a result of the any

of the candidate plans.

14. **Baseline Cost Estimate For Real Estate.**

Land cost estimates were based on a Real Estate Cost Estimate Report prepared by the Appraisal Branch of the Sacramento District Real Estate Division and approved at the District level on 2 September 2005. Costs are estimated at September 2005 price levels. All lands, regardless of ownerships, have been estimated at fair market value. Contingencies take into account severance damage, unknown property splits, undetected improvements, minor project design changes and any additional costs involved in the application of PL 91-646. The difference between State and Federal appraisal rules have been considered and are not expected to have any appreciable impact on the estimated real property costs.

The Federal costs for Engineering Design, review of the PCA, monitoring the acquisitions, certifying for construction, and crediting the partner were estimated by the Sacramento District Real Estate Division, taking into consideration that its involvement with the project will continue for several years.

A summary of the Real Estate Baseline Cost Estimate is shown below.

Table 14.1 **Baseline Cost Estimate**

<b>non-Federal Administrative Costs</b>	<b>Lands*</b>	<b>Total* LERRDs</b>
<b>\$700,000</b>	<b>\$7,400,000</b>	<b>\$8,100,000</b>

\*Includes lands, improvements, damages, severances and contingencies.

Table 14.2

<b>Federal Administrative Costs</b>	<b>\$111,000</b>
-------------------------------------	------------------

\*Includes contingencies.

15. **Map and Tract Register.**

See Exhibit A.

16. **Mineral Interests/Activity.**

No marketable mineral rights will be encountered or impacted in any of the features addressed in this Real Estate Plan.

17. **Hazardous, Toxic, Or Radioactive Waste (HTRW).**

A Phase I Environmental Site Assessment (ESA) was completed for this project in May 2005. The summary of this Assessment, discussed in Chapter 314 of the

Supplemental Environmental Impact Statement (SEIS) / Supplemental Environmental Impact Report (SIER), identified only five (5) relative small sites, for further investigation or removal for potential HTRW release. All of these sites are on Reclamation administered Federal property. Of these five (5) sites, only three (3) are within or in direct proximity of the bridge or roadway alignment. As a part of our coordination with Reclamation, these three (3) potential sites will be brought to their attention for investigation and resolution prior to the issuing of an easement to construct this project.

**18. Sponsors Ability To Acquire.**

The non-Federal sponsor of the bridge is the City of Folsom and the Sacramento Flood Control Agency (SAFCA), as an LPCA partner. The City of Folsom has the ability to acquire land and right of way from private and public utilities; however, Folsom cannot condemn either the State of California or the Federal Government. The Bureau of Reclamation must provide lands as a willing partner or by Congressional Direction should they not be willing. The State of California, although they can be condemned, has indicated that they will act as a willing seller. The California Department of Parks and Recreation has an enhanced bike-trail as incentive to act as a willing seller, while the California Department of Corrections recognizes the need for the bridge.

The sponsor has been advised of P.L. 91-646 requirements and the requirements for documenting expenses for credit purposes. A checklist showing the Sponsors ability to acquire and a certified financial plan will be prepared to document their abilities.

**19. Proposed Estates.**

The proposed estates to construct and maintain the Folsom Bridge Project include Fee Simple, Permanent Road Easements and Temporary Work Area Easements (TWAE).

**20. Facility/Utility Relocations.**

**Facilities.**

Several existing facilities or functions would need to be relocated prior to construction of the Folsom Dam Road segment west of the new bridge. These include Reclamation's storage yard, the ARWEC, State Parks Folsom Lake SRA offices.

Materials and parking at the Reclamation's storage yard would be relocated to an area east of the Reclamation shop buildings near the existing HTRW storage yard property and likely lease it as open space.

The existing public functions of the ARWEC and State Parks offices would be relocated to new buildings in a suitable location within an area of about 5 acres near the new intersection. Relocation of ARWEC and State Parks personnel and functions would be coordinated to minimize disruption as much as possible. Some of the existing buildings would be demolished and some would be retained for other uses.

Apartment complex facilities including parking, storage, and two tennis courts would be replaced or compensated.

**Utilities.**

Types of utilities in the project area include electricity, telephone, cable, waste water and sewer, and water supply. Any utilities affected by relocation of facilities or construction of the intersections, roadway, and bridge would be relocated or replaced. These include at least 10 wooden poles carrying electric, telephone, and cable utilities; utilities associated with the ARWEC, State Parks offices, and Reclamation's storage yard; and two or three high-powered electric utility towers owned by SMUD. The wooden poles would be relocated, and the towers would be relocated to other locations in the project area (approved by SMUD) and replaced with steel pole structures.

**21. Zoning.**

Lands under consideration for the proposed alternatives are zoned open space with the exception of the apartment building complex. All open space zoning is within the Folsom Dam Project or the CDC. Proposed mitigation lands are within the American River Parkway.

**22. Attitude Of Land Owners And Community.**

The project has the wide support of the citizens who live, work and commute within the project area to construct the new bridge and roadway as quickly as possible.

**23. Other.**

Date of value of the report is September 2005. Field examinations of the subject properties were completed on August 18, 2005.

**24. Acquisition Schedule.**

A detailed acquisition schedule is shown on the Table below. The local non-Federal sponsor has reviewed and co-developed this schedule. The local non-Federal sponsor will be directed to begin real property acquisition for the project only after the PCA is fully executed. They are aware of the risks of initiating the acquisition process in advance of the PCA being executed.

<b>REAL ESTATE ACQUISITION SCHEDULE</b>				
<b>Project Name: FOLSOM DAM RAISE, BRIDGE COMPONENT</b>	<b>COE Start</b>	<b>COE Finish</b>	<b>NFS Start</b>	<b>NFS Finish</b>
Receipt of preliminary drawings from Engineering/PM				
Receipt of final drawings from Engineering/PM	07/06	07/06		
Execution of PCA	August 2006			
Formal transmittal of final drawings & instruction to acquire LERRDS	07/06	07/06		
Conduct landowner meetings			02/06	03/06
Prepare/review mapping & legal descriptions	12/05	01/06		
Obtain/review title evidence			07/05	08/05
Obtain/review tract appraisals			03/06	06/06
Conduct negotiations			07/06	08/06
Perform closing			07/06	08/06
Prepare/review condemnations			07/06	08/06
Perform condemnations			08/06	08/06
Obtain Possession				11/06
Complete/review PL 91-646 benefit assistance	N/A	N/A		
Conduct/review facility and utility relocations	06/05	07/06	02/06	01/07
Certify all necessary LERRDS are available for construction	08/06	08/06		
Prepare and submit credit requests			11/06	12/06
Review/approve or deny credit requests	01/07	03/07		
Establish value for creditable LERRDS in F&A cost accounting system				

NFS - Non-Federal Sponsor

COE - Corps of Engineers

22.

**ASSESSMENT OF NON-FEDERAL SPONSOR'S  
REAL ESTATE ACQUISITION CAPABILITY**

**FOLSOM BRIDGE STUDY**

**SPONSOR:** City of Folsom

**I. Legal Authority:**

- a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes? **Yes**
- b. Does the sponsor have the power of eminent domain for this project? **Yes**
- c. Does the sponsor have "quick-take" authority for this project? **Yes**
- d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary? **No**
- e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? **Yes, the U.S.A. and State of California.**

**II. Human Resource Requirements:**

- a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended? **No**
- b. If the answer to II.a. is "yes," has a reasonable plan been developed to provide such training? **N/A**
- c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project? **Yes**
- d. Is the sponsor's project in-house staffing level sufficient considering its other workload, if any, and the project schedule? **Yes**
- e. Can the sponsor obtain contractor support, if required, in a timely fashion? **Yes**
- f. Will the sponsor likely request USACE assistance in acquiring real estate? **No**

**II. Other Project Variables:**

- a. Will the sponsor's staff be located within reasonable proximity to the project site? **Yes**
- b. Has the sponsor approved the project real estate schedule/milestones? **Yes**

**IV. Overall Assessment:**

- a. Has the sponsor performed satisfactorily on other USACE projects? **Yes**
- b. With regard to this project, the sponsor is anticipated to be:  
**City of Folsom, California and the Sacramento Flood Control Agency (SAFCA), as the LPCA partner.**

**V. Coordination:**

- a. Has this assessment been coordinated with the sponsor? **Yes**
- b. Does the sponsor concur with this assessment? **Yes**

**Prepared by:**

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**Dee La Sala  
Realty Specialist  
Acquisition Branch**

**Date** \_\_\_\_\_

**Reviewed and Approved by:**

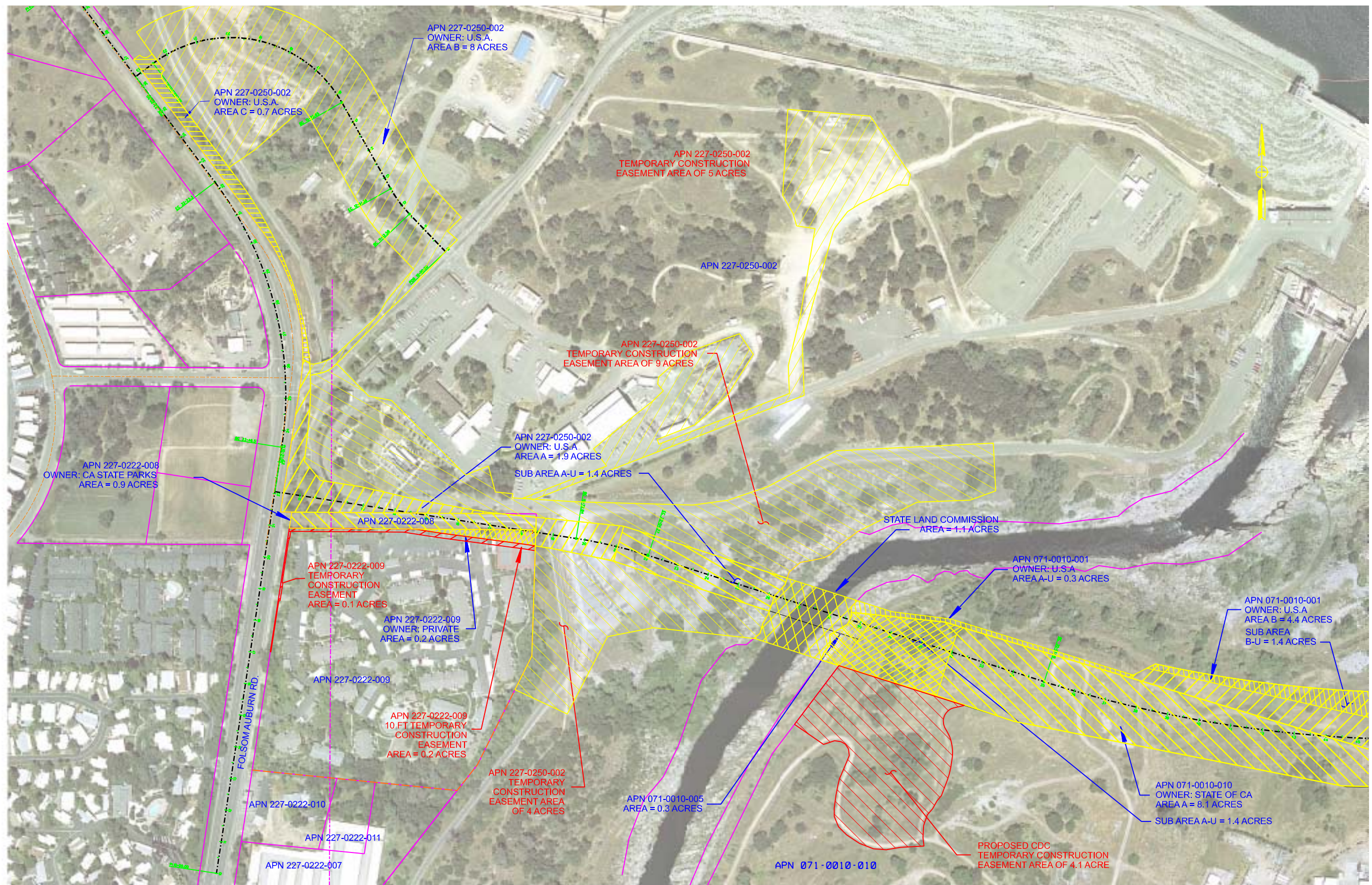
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**Marvin D. Fisher  
Chief, Real Estate Division**

**Date** \_\_\_\_\_

**EXHIBIT A**  
**(Tract Register and Map)**

Folsom Bridge Project				Project Real Estate Requirements				
APN	MAP	OWNER	ADDRESS	PARCEL AREA	FEE	P.R.E.	T.W.A.E.	ZONING
	SHEET			ACRES	ACRES	ACRES	ACRES	
		<b>SACRAMENTO COUNTY</b>						
71-0010-001		U.S.A.		65.53		30.40	6.90	
71-0010-005		U.S.A.		15.13		0.30		
71-0010-010		STATE OF CALIFORNIA	California Dept. of Corrections	810.52		12.90	5.50	
71-0040-001		U.S.A.		65.53		1.10	0.10	
71-0040-095		CAPITOL INVESTMENT TRUST		8.20	4.40			
71-0990-040		CITY OF FOLSOM	50 East Natoma Street, Folsom, CA 95630	4.36	0.40			
27-0222-008		STATE OF CALIFORNIA	State Parks parcel	0.85	0.85			
27-0222-009		DEMMON FAMILY PARTNERSHIP	7550 Folsom Blvd., Folsom , CA 95630	13.92	0.20		0.30	
27-0250-002		U.S.A.		191.54		4.80	10.20	
			<b>TOTAL IN ACRES =</b>	<b>1175.58</b>	<b>5.85</b>	<b>44.70</b>	<b>23.00</b>	
		<b>LEGEND</b>						
FEE =		FEE						
P.R.E. =		PERMANENT ROAD EASEMENT						
T.W.A.E. =		TEMPORARY WORK AREA EASEMENT (BORROW SITE)						
ZONING =		PLEASE SEE ATTACHED SHEET FOR EXPLANATION OF ZONING CODES						



**CH2MHILL / URS Team**  
a joint venture

FOLSOM BRIDGE PROJECT – 6 GATES SPILLWAY ALT  
PRELIMINARY RIGHT OF WAY AND EASEMENTS EXHIBIT  
1 OF 3

SCALE 1" = 300'

APRIL 26, 2006



**CH2MHILL / URS Team**  
a joint venture

FOLSOM BRIDGE PROJECT – 6 GATES SPILLWAY ALT  
PRELIMINARY RIGHT OF WAY AND EASEMENTS EXHIBIT  
2 OF 3

SCALE 1" = 300'

APRIL 26, 2006

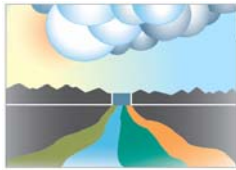


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a joint venture

FOLSOM BRIDGE PROJECT  
PRELIMINARY RIGHT OF WAY AND EASEMENTS EXHIBIT  
3 OF 3

SCALE 1" = 300'

APRIL 26, 2006



American River Watershed Project

Post Authorization Decision Document

# **American River Watershed Project**

## **Folsom Dam Raise, Folsom Bridge**

## **Appendix D: Cost Distribution and Funding Obligations**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

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# **American River Watershed Project Folsom Dam Raise Post Authorization Decision Document**

## **Appendix D Cost Distribution & Funding Obligations**

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## Introduction

The Folsom Dam Raise Project, as described in the 5 November 2002 Long Term Study Chief's Report includes

- raising Folsom Dam and its appurtenant dikes and Mormon Island Dam by 7 feet,
- enlarging L.L. Anderson Dam spillway to prevent dam failure during a probable maximum flood (PMF) event,
- ecosystem restoration at three sites along the lower American River, and
- constructing a temporary bridge immediately downstream of Folsom Dam to mitigate for the closure of the dam road during construction.

The project was initially authorized in the Energy and Water Development Appropriations Act of 2004 as described in the 2002 Chief's Report with the exception that a permanent bridge would be built in place of the temporary bridge. The Appropriations Act of 2006 then modified the 2004 Act.

The bridge cost distribution and cost sharing are complex. This appendix describes the cost distribution of the Folsom Dam Raise Project that includes the temporary bridge and then applies this to funding of the permanent bridge as a stand-alone feature. A determination of the distribution of the costs of the Folsom Bridge is needed to determine cost sharing between the different participating agencies. A portion of the bridge cost is assigned to the Folsom Dam Raise project as authorized. The funding obligations of the Corps, SAFCA, the State and City of Folsom are shown.

All LL Anderson Dam spillway improvement costs were part of the Folsom Dam Raise project when it was first authorized. Since then, a portion of the LL Anderson costs have been determined to be the sole responsibility of the Placer County Water Agency (PCWA) due to dam safety problems at that dam. This is explained later in this appendix.

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## Principles of Agreement

The Corps is responsible for determining funding obligations for each respective cost-share partner. The term “funding obligation” means the amount of funds that each of the Federal (Corps) and non-Federal (SAFCA, the State of California, and City of Folsom) partners will provide to initiate and complete the project. The method used by the Corps in determining the individual funding obligations is based upon statutory requirements associated with flood damage reduction projects and other public laws specific to this Folsom Dam Raise project. Methods and assumptions for determining individual funding obligations will not supersede Reclamation cost recovery requirements.

Reclamation is responsible for recovering Federal expenditures, as appropriate, once the project is completed and transferred into service. The term “cost recovery” refers to repayment by project beneficiaries, in this case the Contractors, of certain Federal (Corps) costs in completing the project. All cost recovery actions, including determinations of reimbursability, allocation of costs among project purposes, water rates, direct billings, etc. will be determined by Reclamation in accordance with reclamation law, policies, standards, and directives.

In this report, the term ‘cost distribution’ means the division and assignment of project costs to different purposes or programs, such as to dam safety and flood damage reduction. It is a necessary step before determining cost share responsibilities, as the different purposes and programs have different cost share rules. Use of the term does not mean the addition of dam safety recovery costs to CVP water rates.

## Authorization of Folsom Dam Raise Project and Folsom Bridge

The Folsom Dam Raise project is authorized under Public Law 108-137, Energy and Water Appropriations Act, 2004 and includes the following language concerning the cost of the project that includes the bridge:

*Section 128. AMERICAN RIVER WATERSHED, CALIFORNIA.*

*(a) IN GENERAL—The Secretary of the Army is authorized to carry out the project for flood damage reduction and environmental restoration, American River Watershed, California, substantially in accordance with plans, and subject to the condition described in the Report of the Chief of Engineers dated November 5, 2002, at a total cost of \$257,300,000, with an estimated Federal Cost of \$201,200,000 and an estimated non-Federal cost of \$56,100,000; except that the Secretary is authorized to accept fund from State and local governments and other Federal agencies for the purpose of constructing a permanent bridge instead of the temporary bridge described in the recommended plan and may construct such permanent bridge if all additional cost for such bridge, above the*

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*\$36,000,000 provided for in the recommended plan for bridge construction, are provided by such governments or agencies.*

*Section 134. BRIDGE AUTHORIZATION. There is authorized to be appropriated \$30,000,000 for the construction of the permanent bridge in section 128(a).*

The Energy and Water Appropriations Act of 2006 provided further authorization for the bridge, modifying the 2004 authorization, as follows:

*Section 128. American River Watershed, California (Folsom Dam and Permanent Bridge)-*

*(b) SECRETARY'S ROLE- Section 134 of Public Law 108-137 is modified to read as follows:*

*Sec. 134. BRIDGE AUTHORIZATION.*

*'There is authorized to be appropriated to the Secretary of the Army \$30,000,000 for the construction of the permanent bridge described in section 128(a), above the \$36,000,000 provided for in the recommended plan for bridge construction. The \$30,000,000 shall not be subject to cost sharing requirements with non-Federal interests.'*

*(c) CONFORMING CHANGE- Section 128(a) of Public Law 108-137 is modified by deleting 'above the \$36,000,000 provided for in the recommended plan for bridge construction,' and inserting in lieu thereof the following: 'above the sum of the \$36,000,000 provided for in the recommended plan for bridge construction and the amount authorized to be appropriated by section 134, as amended,'.*

*(d) MAXIMUM COST OF PROJECT- The costs cited in subsections (b) and (c) shall be adjusted to allow for increases pursuant to section 902 of Public Law 99-662 (100 Stat. 4183). For purposes of making adjustments pursuant to this subsection, the date of authorization of the bridge project shall be December 1, 2003.*

## **Changes Since Authorization**

Since the initial authorization of the project in 2004, there have been no changes to the Folsom Dam raise and ecosystem restoration plan, although the cost estimates have increased due to the price level update. A major change to the project cost estimate is the addition of the cost of the permanent bridge as an added increment to the temporary bridge.

The plan to enlarge the LL Anderson Dam spillway as presented in the Long Term Study report has not changed. It has been determined that the

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spillway is not capable of safely passing the PMF flood and the Placer County Water Agency (PCWA), the owner of the dam, is required by FERC and the State to enlarge the spillway. Therefore, a portion of the LL Anderson Dam spillway enlargement cost is now the responsibility of PCWA and is no longer a project cost. Studies are underway to refine the design and cost estimate for the spillway enlargement.

The 2006 authorization provides that the \$36 million for the temporary bridge and the \$30 million Federal contribution for the permanent bridge may be increased as set forth by PL99-662 Section 902 regarding maximum project costs. The maximum project cost allowed by Section 902 includes the authorized cost (adjusted for inflation to the current price level and through the construction period), the current cost of any studies, modifications, and actions authorized by the WRDA of 1986 or any later law, and 20 percent of the authorized cost (without adjustment for inflation). The maximum fully funded costs for the temporary and permanent bridge increments have been computed to be \$49.3 million and \$41.0 million, respectively. Because the Federal contribution toward the permanent bridge is considered a first cost, the Section 902 limit has been adjusted to \$39.7 million at the current October 2005 price level.

In the current plan, the permanent bridge replaces the temporary bridge needed for flood damage reduction. Thus, the cost of the temporary bridge, up to a maximum of \$49.3 million, is distributed to the Folsom Dam Raise Project since the temporary bridge is required for the project and is cost shared accordingly. The cost of the bridge that exceeds \$49.3 million is considered to be the cost of the permanent bridge increment. The permanent bridge increment is not cost shared according to flood damage reduction project rules but the City of Folsom will pay the cost that exceeds the maximum Federal contribution of \$39.7million.

Table D-1 shows (a) the cost of the project last presented to Congress as described in the 5 November 2002 Long Term Study Chief of Engineers Report at October 2001 price level, (b) the 2004 Congressionally authorized cost, (c) the authorized cost updated to October 2005 price levels, (d) the authorized cost estimate reported in the 2002 Chief's report at October 2005 price levels, and (e) the current plan cost estimate at October 2005 price level. Although the 2002 Long Term Study specified a cost breakdown between flood damage reduction and ecosystem restoration components, there was no breakdown in the authorization. The increased temporary bridge cost from \$42.2 to \$46.9 million reflects cost engineering updates. The total bridge cost is estimated at \$104.1 million. The difference between the total bridge cost and the temporary bridge cost is \$57.2 million and is applied to the permanent bridge increment. The cost of the temporary bridge at \$46.9 million is less than the Section 902 limit converted from fully funded to October 2005 price level, or \$48.7 million.

**Table D- 1 Summary of Changes in Total Project First Costs (\$1,000)**

Item	Project Cost Last Presented to Congress <sup>1</sup> Oct 2001 Price Level	Authorized Cost by Congress <sup>2</sup> Oct 2003 Price Level	Authorized Cost (b) Updated to Oct 2005 Price Level <sup>3</sup>	Authorized Project Cost(a) Updated to Oct 2005 Price Level <sup>4</sup>	Currently Recommended Plan at Oct 2005 Price Level <sup>5</sup>
	a	b	c	d	e
Folsom Dam Raise	174.1			211.0	211.0
L.L. Anderson Dam Spillway Modification	12.1			14.7	14.7 <sup>6</sup>
Ecosystem Restoration	27.4			33.1	33.1
Temporary Bridge	35.0			42.2 <sup>7</sup>	46.9 <sup>8</sup>
Permanent Bridge Increment	0			0	57.2 <sup>9</sup>
Total Project	248.6	257.3	293.0	301.0	362.9 <sup>10</sup>

<sup>1</sup> Authorized Project cost estimate as described in the 5 November 2002 Chief of Engineers Report for the Long Term Study, October 2001 price level

<sup>2</sup> Authorized cost cited in the 2004 Energy and Water Development Act, October 2003 price level

<sup>3</sup> Authorized cost updated to October 2005 price level

<sup>4</sup> Cost estimate of the authorized plan, October 2005 price level.

<sup>5</sup> Cost estimate of the currently recommended plan, October 2005 price level.

<sup>6</sup> The total cost of LL Anderson Dam spillway modification. However, since authorization, it has been determined that PCWA would be responsible for the cost of \$6.7 million to modify the spillway for LL Anderson Dam licensing requirements by the State and FERC.

<sup>7</sup> Cost estimate for the temporary bridge in the Long Term Study at October 2005 price level.

<sup>8</sup> Cost of the temporary bridge, including updated engineering studies.

<sup>9</sup> The cost attributed to the permanent bridge increment, which is the total cost of the bridge at \$104.1 million less the cost of the temporary bridge.

<sup>10</sup> Includes PCWA responsibility for LL Anderson dam safety. See footnote 6.

### **Folsom Dam Raise Cost Estimate**

Table D-2 is a summary of sunk costs. Table D-3 is a summary of the first costs of the currently recommended project at October 2005 price levels. The selected bridge alternative was identified in Chapter 3 of the main report. The purposes of the current project are flood damage reduction and ecosystem restoration. While achieving flood damage reduction by raising Folsom Dam, the issues of dam safety and public transportation access during construction are also being addressed. The issue of dam safety is being addressed by enlarging the spillway at LL Anderson Dam and the contribution of Folsom Dam Raise to safely passing the PMF. The access issue is being addressed by constructing the authorized permanent bridge below Folsom Dam. The ecosystem restoration plan is the same as that presented in the 2002 Long Term Study.

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**Table D- 2 Summary of Sunk Costs (\$1,000)**

Year	Bridge Expenditures		Raise Project Expenditures	Total
	Temporary Bridge	Permanent Bridge		
Pre-FY04 (pre-authorization)	2,260	0	13,870	16,130
FY-04	650	500	1,860	3,010
FY-05	<u>2,510</u>	<u>1,890</u>	<u>2,550</u>	<u>6,950</u>
Total Sunk Cost Through FY-05 <sup>1</sup>	5,420	2,390	18,280	26,090

<sup>1</sup> Total expenditures through FY-05 are considered financial sunk costs for cost sharing computations and are not included in the computation of annual costs.

**Table D- 3 Folsom Dam Raise Project First Cost Estimate (\$1,000)**

Element	Current Plan at Oct 2005 Price Level
<b>Raise Folsom Dam</b>	
Construction	152,000
Lands	900
Relocation	2,800
Environmental Mitigation	4,900
Cultural Resources	1,900
ED/SA	30,200
PED Sunk Costs	<u>18,300</u>
<b>Total</b>	<b>211,000</b>
<b>L.L. Anderson Dam Spillway Enlargement<sup>1</sup></b>	
Construction	11,300
Lands	0
Environmental Mitigation	0
ED/SA	<u>3,400</u>
<b>Total</b>	<b>14,700</b>
<b>Bridge</b>	
Construction	68,900
Lands	8,100
Relocations	4,000
Environmental Mitigation	3,000
Cultural Resources <sup>2</sup>	500
ED/SA	11,800
PED Sunk Costs	<u>7,800</u>
<b>Total Bridge</b>	<b>104,100</b>
<b>Ecosystem Restoration</b>	
Bushy Lake	
Construction	6,300
Cultural Resources	900
Lands	500
ED/SA	<u>1,400</u>
<b>Total</b>	<b>9,100</b>
Woodlake	
Construction	2,800
Cultural Resources	200
Lands	600
ED/SA	<u>700</u>
<b>Total</b>	<b>4,300</b>
Temperature Shutters	
Construction	15,500
Lands	0
ED/SA	<u>4,200</u>
<b>Total</b>	<b>19,700</b>
<b>Total Ecosystem Restoration</b>	<b>33,100</b>
<b>Total Project</b>	<b>362,900</b>

<sup>1</sup> The full cost of enlarging L.L. Anderson Dam spillway to the capacity of the Corps' Probable Maximum Flood (PMF) (before subtraction of PCWA responsibility).

<sup>2</sup> 1% of the total federal construction cost of the bridge.

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## **Dam Safety Risk Associated with L.L. Anderson and Folsom Dams**

At present, the spillway at L.L. Anderson Dam is inadequate to handle the Probable Maximum Flood (PMF). A failure during such an event would increase the peak flows into Folsom Reservoir. The existing Folsom Dam also has a PMF dam safety deficiency. Currently, Folsom Dam is capable of handling roughly 70 percent of the PMF. A failure of L.L. Anderson Dam during a PMF event increases Folsom Dam's risk of failure. The peak inflow to Folsom Dam would increase from 906,000 cubic feet per second (cfs) to 1,183,000 cfs for the PMF event and the extent of overtopping would increase from 2.1 to 3.4 feet. Additional storage or discharge capacity must be provided via the Dam Raise Project to pass 100 percent of the PMF.

The work required to correct the LL Anderson Dam spillway deficiency is regulated by the California Division of Safety of Dams and by the Federal Energy Regulatory Commission (FERC). The 2002 Chief's Report provided that in the event the dam's owner, the PCWA, was required by the State or by FERC to modify the spillway, that work would be considered a without-project condition, would be the responsibility of PCWA, and the project would be modified accordingly. PCWA has estimated that the PMF flow is 59,100 cfs and recognizes that L.L. Anderson Dam has deficient spillway capacity. The State and FERC requirements were identified in July 2005 and, due to potential legislation regarding federal involvement in the project, the plan and schedule for correcting the spillway deficiency will be provided by October 2006. The cost distribution would be adjusted based upon the resolution of the State and FERC issue mentioned above.

Once PCWA plans are known, the Corps, in consultation with Reclamation, will reevaluate the risk of the PMF failing LL Anderson Dam.

Dam safety improvement is a benefit that makes possible the continued, safe operation of the dam for all of its purposes. The value of dam safety is thus reflected in the value of flood control, water supply, hydropower, fish and wildlife, and recreation that Folsom Dam provides. The continued operation of Folsom Dam provides major monetary and non-monetary benefits. Thus, dam safety benefits, as calculated by the Corps, may be considered at least equal to costs.

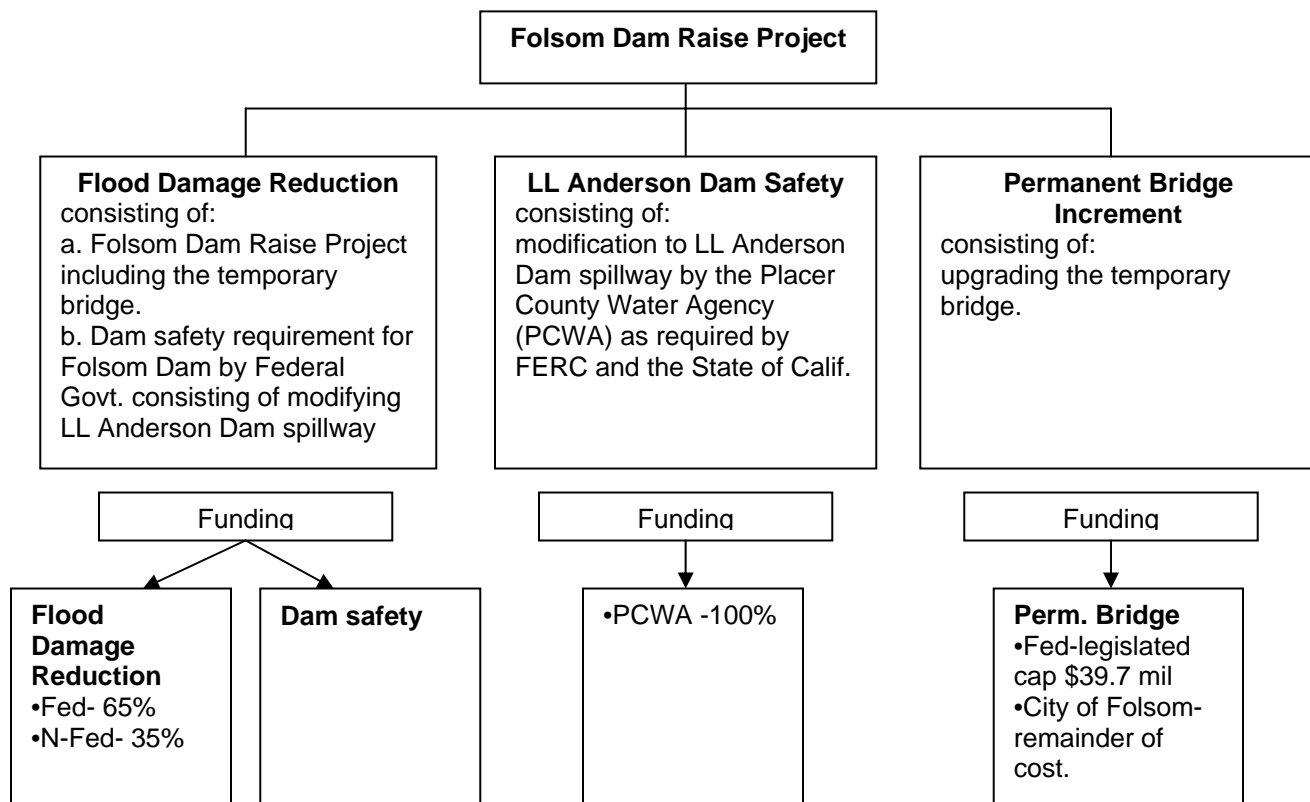
The Corps estimates the L. L. Anderson Dam PMF is 66,700 cfs, and has performed detailed design work to expand the L. L. Anderson Dam spillway capacity to contain this higher flow. The results presented in Appendix A, Part 4 of the "L. L. Anderson Dam Alternative Methods for Increasing Spill Capacity to Safely Pass the Probable Maximum Flood (PMF)," dated March 2005, was based upon the Corps Inflow Design Flood (IDF), the analysis used for the dam safety study at L. L. Anderson Dam. The PMF is based on Corps' criteria and guidance. The Corps used reproductions of several historical floods to develop the basin's most severe antecedent conditions and basin parameters. In comparison to the estimate made by PCWA's contractor, the Corps estimate demonstrates that the

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difference is due to the fact that there would be 2.5 times more snowmelt during the 72-hour Probable Maximum Precipitation (PMP) storm. The snowmelt conditions reflect the snow pack and winds that occurred during the January 1997 flood. The Corps chose a more severe temporal distribution, recommended by NOAA and found in NOAA publications, and used a higher peaked unit hydrograph from an extensive modeling effort by both the Sacramento District and Reclamation, Denver office, as recommended in ER 1110-8-2. This resulted in more water being available for runoff than the PCWA study. The Corps' peak unit hydrograph was higher, the snowmelt contribution was higher, the precipitation distributions were less severe than NOAA's HMR (Hydrometeorological Report) # 59 and HMR # 36 recommended. These differences produced higher peaks. The only significant thing that was the same was PCWA contractor's 6 hour 72 hour storm totals.

### **Distribution Percentages of Flood Damage Reduction, Dam Safety and Bridge**

The flow chart below summarizes how costs were distributed and funding obligations determined for the Folsom Dam Raise Project (except for ecosystem restoration, which is fully separable from flood damage reduction). Funding is divided into 3 major components; (1) flood damage reduction consisting of raising Folsom Dam and dikes, construction of the temporary bridge and dam safety by enlarging the LL Anderson Dam spillway to the extent that is required for the safety of Folsom Dam, (2) the enlargement of L.L. Anderson Dam spillway to extent required by FERC and the State of Calif. for the safety of that dam and is the sole responsibility of the PCWA, and (3) the permanent bridge increment construction cost. The distribution of costs as shown in the figure is explained in the following paragraphs.



### Distribution of Bridge Cost to Temporary and Permanent Increments

It is necessary to separate the costs for the permanent bridge increment from the temporary bridge to determine funding obligations. The City of Folsom funds (pays for) the permanent bridge increment cost that exceeds the maximum authorized Federal contribution.

Table D-4 summarizes how the bridge costs are distributed between the permanent and temporary increments. As previously stated, the cost of the permanent bridge increment is the difference between the total bridge cost and the temporary bridge cost. The total bridge costs for each account have been determined by cost estimating. The amounts for each cost account for the temporary and permanent bridge increments were then determined on the basis that (1) the sunk costs for planning, engineering, and design (PED) tasks are all part of the temporary bridge because the PED tasks are flood damage reduction costs, (2) the cultural resources cost is 1% of the Federal construction cost and (3) the temporary bridge would be built fully within Federal property and therefore has no LERRDs; all lands, easements, rights-of-way, and relocations are part of the permanent bridge increment. The remaining costs were determined by approximate ratio of the total bridge cost to the temporary bridge cost.

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The permanent bridge plan includes a Class II bicycle/pedestrian path although it is not allocated to a separate recreation purpose.

**Table D- 4 Bridge Cost Distributed to Temporary and Permanent (\$1,000)**

Cost Account	Total Bridge	Temporary Bridge Increment	Permanent Bridge Increment
Total First Cost	104.1 <sup>1</sup>	49.9 <sup>2</sup>	57.2
Lands	8.1	0	8.1
Relocations	4.0	0	4.0
Environmental Mitigation	3.0	1.7	1.3
Cultural Resources	0.5	0.3	0.2
ED/SA	11.8	6.6	5.1
PED Sunk Costs	7.8	5.4	2.4
Construction	68.9	32.8	36.1

<sup>1</sup> Estimate of total first cost of the permanent bridge.

<sup>2</sup> Estimate of first cost of the temporary bridge.

<sup>3</sup> Estimate of the permanent bridge increment or the difference between the total cost of the permanent bridge and the cost of the temporary bridge.

### **Distribution of L.L. Anderson Dam Spillway Modification Costs to Flood Damage Reduction and PCWA**

The authorized project for flood damage reduction includes the total cost for L.L. Anderson Dam spillway enlargement. The Corps' estimate for the spillway enlargement is \$14.7 million. This contrasts with the PCWA estimated cost for their design of about \$7.8 million.

The current project includes the Corps' spillway widening design. However, a portion of this spillway work is considered the responsibility of the PCWA. The PCWA has informally agreed that they will reimburse the Federal government for the amount calculated as their responsibility. The cost apportionment is accomplished by a modified separable cost remaining benefit (SCRB) method of cost allocation. The SCRB is considered an acceptable and fair method to allocate costs between project purposes on water resources projects, and can be used here to equitably divide costs between flood damage reduction and PCWA's responsibility. The modifications include the use of first costs rather than annual costs, and benefits of single-purpose dam safety alternatives (as calculated by the Corps) are equal to costs. The cost apportionment is shown in Table D-5. The modified SCRB is used in this evaluation for making a preliminary determination of PCWA's funding obligation.

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PCWA and the Corps are discussing how to fund LL Anderson spillway, and an agreement will be reflected in a future PCA.

This cost distribution is preliminary. PCWA is revising its plan to control the PMF. FERC and the State of California dam safety office will review and approve PCWA's plan. When complete, the Corps will compare its plan with the PCWA plan to determine a new cost distribution, or possibly to move the LL Anderson improvements entirely out of the project.

The costs of the two single-purpose alternatives that are input to the SCRB are (1) the PCWA spillway modification cost at \$7.8 million and (2) the cost to further enlarge the PCWA spillway to meet the Corps' PMF at a cost of \$9.1 million as if PCWA had already built their spillway.

Both the Corps and PCWA spillway enlargement plans generally consists of replacement of the ogee spillway and spillway gates, and excavation and disposal of material to enlarge the downstream channel. The PCWA design consists of widening both the spillway and channel, and a single crest wall. The Corps' single-purpose project would realize a cost savings, as the project would excavate less downstream channel material, and would build a short parapet wall, rather than the alternative of the ogee spillway and replacing the gates. A preliminary level cost estimate was done to cost out the parapet wall. For this SCRB analysis, the Corps calculated the benefits as equal to the cost. The spillway enlargement is done for dam safety purposes. Dam safety improvement is a benefit that makes possible the continued, safe operation of the dam for all of its purposes. The value of dam safety is thus reflected in the value of flood control, water supply, hydropower, fish and wildlife, and recreation that Folsom Dam provides. The continued operation of Folsom Dam provides major monetary and non-monetary benefits; therefore, for purposes of determining funding obligations, dam safety benefits may be considered at least equal to costs. Table D-5, the SCRB distribution of L.L. Anderson costs between the Federal flood damage reduction project and PCWA's responsibility, shows that PCWA is responsible for 46 percent of the total cost of \$14.7 million, or \$6.7 million. The balance of \$8.0 million is part of the flood damage reduction project.

**Table D- 5 Modified SCRB Apportionment of L.L. Anderson Spillway Modification Costs to Flood Damage Reduction and PCWA (\$1,000)**

Item	Single Purpose PCWA Spillway	Single Purpose Federal Project Add-On to PCWA Spillway	Actual Project
Single Purpose Benefits <sup>1</sup>	7,800	9,100	
Single Purpose Costs	7,800	9,100	
Limited Benefits	7,800	9,100	
Separable Costs	5,600	6,900	
Remaining Benefits—Amount	2,200	2,200	
Remaining Benefits—Percent	50%	50%	100%
Joint Costs			2,200
Allocated Joint Costs	1,100	1,100	
Total Allocated Costs	6,700 <sup>2</sup>	8,000	14,700 <sup>3</sup>
Percent Allocated Costs	46%	54%	100%

<sup>1</sup> Benefits are equal to the costs for dam safety.

<sup>2</sup> Contribution towards the flood damage reduction project by the PCWA

<sup>3</sup> Total cost of L.L. Anderson Dam Spillway enlargement

The Federal flood damage reduction project, without the PCWA portion of LL Anderson Dam consists of the features and cost as shown in the following table.

**Table D-6 Federal Flood Damage Reduction Project Features**

Feature	First Cost (\$ million)
Raise Folsom Dam and Dikes	211.0
L.L. Anderson Dam Spillway Enlargement	8.0
Temporary Bridge	<u>46.9</u>
Total	265.9

Table D-7 describes the SCRB methodology on how the division of L.L. Anderson Dam spillway costs between flood damage reduction and PCWA are determined.

**Table D- 7 How Division of L.L. Anderson Spillway Costs between Flood Damage Reduction Contributors and PCWA Are Determined**

Item	Single Purpose PCWA Spillway	Single Purpose Federal Project Add-On to PCWA Spillway	Actual Project
Single-Purpose Benefits <sup>1</sup>	PCWA <sup>2</sup> single-purpose benefits	FDR <sup>3</sup> single-purpose benefits	
Single Purpose Costs	PCWA <sup>2</sup> single-purpose costs	FDR <sup>3</sup> single-purpose costs	
Limited Benefits	PCWA <sup>2</sup> Whichever is less, single-purpose benefits or single-purpose costs	FDR <sup>3</sup> Whichever is less, single-purpose benefits or single-purpose costs	
Separable Costs	Total allocated cost minus FDR <sup>3</sup> single-purpose costs	Total allocated cost minus PCWA <sup>2</sup> single-purpose costs	PCWA <sup>2</sup> separable cost plus FDR <sup>3</sup> separable cost
Remaining Benefits			
Remaining Benefits Amount	PCWA <sup>2</sup> limited benefits minus PCWA <sup>2</sup> separable cost	FDR <sup>3</sup> limited benefits minus FDR <sup>3</sup> separable cost	
Remaining Benefits Percent of Total	PCWA <sup>2</sup> remaining benefit amount divided by (PCWA <sup>2</sup> remaining benefit amount plus FDR <sup>3</sup> remaining benefit amount)	FDR <sup>3</sup> remaining benefit amount divided by (PCWA <sup>2</sup> remaining benefit amount plus FDR <sup>3</sup> remaining benefit amount)	PCWA <sup>2</sup> percent total plus FDR <sup>3</sup> percent total
Joint Costs			PCWA <sup>2</sup> allocated joint cost plus FDR <sup>3</sup> allocated joint cost
Allocated Joint Costs	PCWA <sup>2</sup> percent of benefit amount multiplied by total joint costs	FDR <sup>3</sup> percent of benefit amount multiplied by total joint costs	
Total Allocated Costs	PCWA <sup>2</sup> separable cost plus PCWA <sup>2</sup> allocated joint costs	FDR <sup>3</sup> separable cost plus PCWA <sup>2</sup> allocated joint costs	Total project allocated cost
Percent Allocated Costs	PCWA <sup>2</sup> allocated cost divided by total project allocated costs	FDR <sup>3</sup> allocated cost divided by total project allocated costs	PCWA <sup>2</sup> percent allocated costs plus FDR <sup>3</sup> percent allocated costs

<sup>1</sup> Benefits are equal to the costs

<sup>2</sup> Placer County Water Agency

<sup>3</sup> Flood damage reduction— Contribution toward the flood damage reduction project by the Corps, and other non-Federal agencies (State of California and CVP).

### Least-Cost Single Purpose Flood Damage Reduction Plan

The least-cost flood damage reduction only plan shown in Table D-8 is the 7-foot dam raise authorized plan without the L.L. Anderson Dam modification. To fairly divide dam safety costs from the flood damage reduction costs, the SCRB analysis must treat dam safety as if it were a project purpose. Thus L.L. Anderson Dam spillway modification cost may be subtracted from this plan, as its

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only function is to provide dam safety. This is a theoretical plan that would never actually be built. In reality, dam safety is not a purpose, but is required because the dam raise is a major modification that must result in a safe dam. Thus, dam safety is an integral part of flood damage reduction. This plan, without dam safety, however, best serves the spirit of a SCRB analysis for the purpose of identifying dam safety costs and determining funding obligations. This plan also includes the temporary bridge, which is still needed to mitigate traffic impacts.

### **Least-Cost Single Purpose Dam Safety Plan**

A least-cost dam safety only plan and cost estimate is needed for the modified SCRB analysis. The 2002 Long Term Study Chief's Report shows \$93 million allocated to dam safety. However, in 2000 Reclamation completed a Comprehensive Facilities Review, and then did follow up studies that quantified the dam safety risk at Folsom. Reclamation has completed all dam safety analyses in accordance with the Reclamation Safety of Dams Act of 1978, as amended. The Corps and Reclamation are working together on how best to construct Folsom Dam modifications and the dam raise, and resolve dam safety. This work will determine a new least cost dam safety plan. Although this plan and cost are for planning purposes only, the division of costs between flood damage reduction and dam safety is sensitive to this.

Ongoing studies for dam safety include Reclamation's auxiliary spillway for Folsom Dam. Another development that could change the dam safety cost is that the Corps is studying the possibility of using a gated auxiliary spillway as a feature of its Folsom Dam Modification Project. If this change in Folsom Dam Modifications Project were to occur, much of the dam safety problem could be fixed as a pre-project condition for Folsom Dam Raise. Because the Reclamation plan and the Corps' changes to the Folsom Dam Modifications plan are so tentative, there is no reason at this time to change assumptions on dam safety or revise the least cost dam safety plan. Cost data by Reclamation and the Corps are being developed and a cost for the auxiliary spillway may be finalized by October 2006. Dam raise costs for flood damage reduction and dam safety will be redistributed when new information on the dam safety solution is available.

The PCA for the bridge construction is scheduled to be signed before October 2006. The PCA will include provision to allow for amendment because cost percentages between flood damage reduction and dam safety, and thus cost distribution percentages, are tentative. If a new least-cost dam safety only plan is identified, the distribution will be revised accordingly. The least-cost dam safety only plan as shown in Table D-8 remains that of a 3-foot high parapet wall on Folsom Dam, spillway lowering of 6 feet, and enlargement of L.L. Anderson Dam spillway minus the cost determined to be PCWA's responsibility.

**Table D- 8 Flood Damage Reduction and Dam Safety Single-Purpose Costs for SCRB Analysis (\$million)**

Item	Single-Purpose Flood Damage Reduction Project	Single-Purpose Dam Safety Project
First Cost	265.9	213.9
Sunk PED Cost <sup>1</sup>	-23.7	-16.1
L.L. Anderson Spillway <sup>2</sup>	<u>-8.0</u>	<u>0</u>
Total First Cost—Single Purpose	234.2	197.8
Interest During Construction	<u>133.6</u>	<u>112.8</u>
Total Investment Cost	367.8	310.6
Annual Interest and Amortization <sup>3</sup>	20.5	17.3
Annual Operation and Maintenance	<u>0.2</u>	<u>0.2</u>
Total Annual Costs	20.7	17.5

<sup>1</sup> The Sunk PED cost is included in the first cost of the flood damage reduction project and dam safety projects but it is not to be included in the annual cost; therefore, the sunk cost is removed.

<sup>2</sup> LL Anderson Dam Spillway is not included in the single-purpose flood damage reduction project.

<sup>3</sup> Interest Rate = 5.125% and a 50-year period of analysis.

### **Folsom Dam Raise Project Cost Distribution to Flood Damage Reduction and Dam Safety**

As part of the American River Long Term Study, the ASA(CW) determined that, because the Folsom Dam Raise project would remedy an existing Federal dam safety deficiency, it would be appropriate that the Federal government bear an additional burden of project costs (reference is made to CECW-PM Memorandum, dated 7 Sep 2001, subject: American River Long Term Study – Alternative Formulation Study (AFB) Guidance Memorandum, Enclosure 2). Since the tentatively recommended bridge project is presently viewed as a feature of the Folsom Dam Raise flood damage reduction project, and to be consistent with this treatment in the overall flood control project, it is considered appropriate to distribute the bridge costs between flood damage reduction and dam safety.

The 2002 Long Term Study Chief's Report includes in the project description the assignment of costs to dam safety, and that the further refinement of these costs be made based on on-going dam safety studies by Reclamation. The assignment of flood damage reduction costs to dam safety is for the purposes of improved economic analysis and cost distribution to all beneficiaries. Dam safety is not a project purpose, but besides providing a reduction in flood risk, the project solves many of Folsom Dam's existing dam safety deficiencies. During the planning phase, the Corps recognized that dam safety costs should be identified and cost-shared with non-Federal beneficiaries. The flood damage

reduction costs may be cost shared with project non-Federal sponsors for flood control. The project benefits would include flood damage reduction and dam safety, where dam safety benefits (as calculated by the Corps) are equal to dam safety costs.

The preliminary cost distribution study provides information as to the estimated share of reimbursable costs to the project sponsors who are responsible for reimbursement, which are part of the local cooperation requirements.

Costs were distributed between flood damage reduction and dam safety using a modified Separable Costs Remaining Benefits (SCRB) method. Inputs to the SCRB are the least-cost dam safety only plan and the least-cost flood damage reduction only plan.

Table D-9 shows the SCRB division of the costs between flood damage reduction and dam safety. The Table D-6 methodology was used to determine percent distributed to flood damage reduction and dam safety.

**Table D- 9 SCRB Raise Project Cost Distribution to Flood Damage Reduction and Dam Safety (\$1,000,000)**

Item	Flood Damage Reduction (\$)	Dam Safety (\$)	Total Project (\$)
Single-Purpose Benefits <sup>1</sup>	25.1	17.5	
Single-Purpose Annual Costs <sup>2</sup>	20.7	17.5	
Limited Benefits	20.7	17.5	
Separable Costs	4.6	1.4	
Remaining Benefits—Amount	16.1	16.1	
Remaining Benefits—Percent	50%	50%	
Joint Costs			16.1
Allocated Joint Costs	8.1	8.0	
Total Allocated Costs	12.7	9.5	22.2
Percent Allocated Costs	57%	43%	100%

<sup>1</sup> Benefits are greater than the costs; B/C cost ratio >1

<sup>2</sup> Costs are at October 2005 price level, amortization rate is 5.125 percent, 50-year project life.

Of the flood damage reduction total project cost of \$265.9 million, the SCRB distributes 43 percent or \$114.3 million to dam safety and 57 percent or \$151.6 million to flood damage reduction for cost distribution and economic analysis. Figure 1 illustrates the division of these costs.

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### **Cost Sharing of Flood Damage Reduction**

Table D-10 shows the distribution of Federal and non-Federal costs for flood damage reduction only. The current recommended plan is compared with the authorized plan at October 2005 price levels.

**Table D- 10 Flood Damage Reduction Cost Sharing Comparison for Authorized and Recommended Plans(\$1,000)**

MCACES ACCT <sup>3</sup>	Item	Authorized Project October 2005 Price Level <sup>1</sup>			Currently Recommended Project October 2005 Price Level <sup>2</sup>		
		Fed	Non-Fed	Total	Fed	Non-Fed	Total
1	Lands	640	290	930	640	290	930
2	Relocations		2840	2840		2840	2840
4	Construction	195,720		195,720	196,100		196,100
6	Environmental	4,870		4,870	6,580		4,870
18	Cultural Res	1,910		1,910	2,220		2,220
30, 31	ED/SA	60,860	740	61,600	63,170	740	63,910
	<b>Total First Cost<sup>3</sup></b>	264,000	3,870	267,870	268,710	3,870	272,580
	<b>Less PCWA LLA</b>	-		-	-6,700		-6,700
	<b>Subtotal</b>	264,000	3,870	267,870	262,010	3,870	265,880
	<b>Less Dam Safety</b>	110,800		110,800	114,300		114,300
	<b>FDR-DS Subtotal</b>	153,200	3,870	157,070	147,710	3,870	151,580
<b>Flood Damage Reduction Distribution</b>							
	<b>Distribution Subtotal</b>	153,200	3,870	157,070	147,710	3,870	151,580
	<b>Less Cult. Res<sup>4</sup></b>	-1,910		-1,910	-2,220		-2,220
	<b>Adjust. Subtotal</b>	151,290	3,870	155,160	145,490	3,870	149,360
	<b>5% Cash <sup>5</sup></b>	-7,850	7,850	0	-7,580	7,580	0
	<b>Subtotal</b>	143,440	11,720	155,160	137,910	11,450	149,360
	<b>Cash Adjustment</b>	-42,950	42,950	0	-40,830	40,830	0
	<b>Subtotal</b>	100,850	54,310	155,160	97,080	52,280	149,360
	<b>Add Cult. Res.</b>	1,910		1,910	2,220		2,220
	<b>Total</b>	102,760	54,310	157,070	99,300	52,280	151,580
	<b>Percent</b>	65%	35%	100%	65%	35%	100%

1. Authorized Project includes all of L.L. Anderson spillway enlargement cost; temporary bridge is \$46.9 million, October 2005 price level update from \$36 million (October 2001). The SCRB percentages are 57 percent flood damage reduction – 43 percent dam safety.

2. Recommended Plan includes Federal project share of L.L. Anderson spillway only; temporary bridge cost includes additional cost due to design refinements for a total cost of \$46.9 million. The SCRB percentages are 57 percent flood damage reduction – 43 percent dam safety.

3. Cost of total project without ecosystem restoration and the permanent bridge increment.

4. Cultural Resources Data Recovery 1% of Federal Total Construction Cost, non-reimbursable. Cultural Resources cost beyond 1 percent the non-Federal sponsor will cost share 34 percent.

5. Non-Federal requirement to pay in cash 5 percent of total project first cost.

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## **Cost Sharing of Dam Safety for the Folsom Dam Raise Project**

Corps guidance for dam safety cost-distribution is outlined in the Corps' Civil Works Policy Guidance Letter No. 43, updated 19 May 1999. This provides guidance for determining the apportionment of costs of project modification for dam safety assurance purposes, under Section 1203 of WRDA 86. The guidance stipulates that 85 percent of dam safety costs are Federal costs and 15 percent shall be assigned to project purposes in accordance with the cost distribution in effect for the Folsom Dam Raise Project at the time the work is initiated. Reclamation has similar guidance.

Regardless of which agency rules are applied, Reclamation determines the relative percentages for each purpose.

It is Reclamation's responsibility to assign and recover dam safety costs that are appropriately a non-Federal responsibility. The current position of Reclamation is that no bridge-related dam safety costs are assignable to any non-Federal entities who are in any way sponsors of or beneficiaries of the original Folsom Dam project under Reclamation arrangements or contracts. This leaves the non-Federal dam safety costs assignable to the original flood control purpose, and possibly other minor Federal purposes that have been added since the dam was built. As there was no non-Federal sponsor for flood control on the original Folsom Dam, it currently appears that all dam safety costs assigned to the bridge will be the responsibility of the Federal government. Dam safety expenditures correct the original Folsom project, and sponsors for Folsom Dam Bridge, the Modifications and Raise projects will not be responsible for those legacy dam safety costs under their new Project Cooperation Agreements.

## **Cost Distribution of the Bridge**

The bridge cost distribution is shown in Table D-11 and Figure 2. Of the \$104.1 million total cost, the temporary bridge cost of \$46.9 million is allocated to flood damage reduction and dam safety. The \$57.2 million balance is accounted to the permanent bridge. The Energy and Water Development Act of 2004 authorized \$30 million of Federal funding for the permanent bridge and the Energy and Water Development Act of 2006 stipulated that the \$30 million is not subject to cost sharing. To allow for cost increases to the bridge, the 2006 Act also stipulated that the \$36 million and \$30 million shall be adjusted to allow for increases pursuant to PL 99-662 Section 902 cost limitation that are calculated as fully funded amounts of \$49.3 million and \$41.0 million, respectively.

The permanent bridge increment cost of \$57.2 million is the responsibility of the City of Folsom. The Energy and Water Development Acts of 2004 and 2006 provided for a Federal contribution of \$39.7 million at current October 2005 price level. The \$17.5 million balance will be the City of Folsom's share.

The temporary bridge cost of \$46.9 million is initially split between flood damage reduction and dam safety on the percentages determined previously as 57 and 43 percent, respectively. The flood damage reduction cost is then cost shared

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on the standard percentages of 65 percent Federal and 35 percent non-Federal. The dam safety portion is cost shared as described in the above Section *Cost Sharing of Dam Safety for the Folsom Dam Raise Project*. The appropriate non-Federal costs, if any, will be assigned and recovered by Reclamation in accordance with statute and regulation governing the Central Valley Project.

There are no LERRDs for the temporary bridge. The alignment of the permanent bridge (Alternative 3) goes into private lands and SMUD power lines and Reclamation's ARWEC facility need to be relocated; thus LERRDs need to be acquired (See Appendix C: Real Estate). The City of Folsom has agreed to purchase these LERRDs.

**Table D- 11 Federal and Non-Federal Cost Share of Bridge (\$1,000)**

MCACES ACCT <sup>2</sup>	Item	Currently Recommended Project <sup>1</sup>		
	First Costs	Fed	Non-Fed	Total
<b>TEMPORARY BRIDGE</b>				
1	Lands <sup>3</sup>	0	0	0
2	Relocations <sup>4</sup>	0	0	0
08, 11	Construction <sup>5</sup>	32,837	0	32,837
6	Environmental Mitigation	1,710	0	1,710
18	Cultural Resources <sup>6</sup>	306	0	306
30, 31	ED/SA <sup>7</sup>	6,647	0	6,647
	PED Sunk Costs	5,420		5,420
	<b>Subtotal</b>	46,920	0	46,920
<b>TEMPORARY BRIDGE – FLOOD DAMAGE REDUCTION</b>				
	Minus Dam Safety	-19,350	0	-19,350
	<b>Subtotal, Flood Damage Reduction</b>	27,570	0	27,570
	<b>Less Cultural Resources</b>	-306	0	-306
	<b>Subtotal</b>	27,264	0	27,264
	5 % CASH	-1,379	1,379	0
	<b>Subtotal</b>	25,886	1,379	27,264
	Cash Adjustment <sup>8</sup>	-8,160	8,160	0
	<b>Subtotal</b>	17,726	9,539	27,264
	Add Cultural Resources	306	0	306
	<b>Subtotal</b>	18,032	9,539	27,570
	Percent	65	35	100
<b>TEMPORARY BRIDGE – DAM SAFETY</b>				
	Temporary Bridge Subtotal	46,920	0	46,920
	Flood Damage Red Adjustment	-27,570	0	-27,570
	<b>Subtotal, Dam Safety <sup>9</sup></b>	19,350	0	19,350
<b>PERMANENT BRIDGE</b>				
	Lands	0	8,140	8,140
	Relocations	0	4,000	4,000
	Construction	36,031	0	36,031
	Environmental Mitigation	1,290	0	1,290
	Cultural Resources	221	0	221
	ED/SA	4,102	1,000	5,102
	PED Sunk Costs	2,386	0	2,386
	<b>Subtotal</b>	44,030	13,140	57,170
	Cash Adjustment <sup>10</sup>	-4,330	4,330	0
	<b>Subtotal</b>	39,700	17,470	57,170
<b>TOTAL BRIDGE</b>				

MCACES ACCT <sup>2</sup>	Item	Currently Recommended Project <sup>1</sup>		
	First Costs	Fed	Non-Fed	Total
	<b>Permanent + Flood Damage Reduction + Dam Safety</b>	77,082	27,009	104,090
	Percent	71%	29%	100%

#### footnotes

<sup>1</sup> Oct 2005 Price Level.

<sup>2</sup> Micro Computer Aided Cost Engineering System (MCACES) is the software program and associated format used by the Corps in developing cost estimates. Costs are divided into various categories identified as "accounts." Detailed cost estimates are presented in Appendix A: Folsom Bridge Engineering.

<sup>3</sup> Real estate land costs. Land costs are required by the permanent bridge increment. The temporary bridge requires no lands besides existing project lands.

<sup>4</sup> Relocations consist of relocating affected utilities including replacement of Reclamation's American River Water Education Center. All relocation costs are with the permanent increment.

<sup>5</sup> Construction costs (& other costs) were distributed between temporary and permanent increments as shown on Table D-4

<sup>6</sup> Cultural resources data recovery cost is 1% of the total Federal construction cost of the permanent bridge

<sup>7</sup> Engineering and Design, Supervision and Administration.

<sup>8</sup> Adjustment to meet flood damage reduction cost sharing rules of 65 percent Federal, 35 percent non-Federal.

<sup>9</sup> All dam safety cost initially Federal funded. Reclamation will determine non-Federal responsibility for dam safety costs when dam safety costs for the larger Folsom Dam Raise project are revised.

<sup>10</sup> Federal contribution to the permanent bridge increment is \$39.7 million (Section 902 limit on \$30 million at current October 2005 price level).

## Cost Distribution Summary

Table D-12 summarizes the Federal and non-Federal cost share of the flood damage reduction project, L.L. Anderson Dam Spillway enlargement, the permanent bridge, and ecosystem restoration for the current recommended project. See also Figure 1.

**Table D- 12 Folsom Dam Raise Project Cost Distribution Summary by Project Feature (\$1,000,000)**

Item	Current Plan Recommended Project (Oct 2005 Price Level)
<b>Flood Damage Reduction</b>	<b>265.9</b>
Flood Damage Reduction	151.6
Federal	99.3
Non-Federal—State of California	52.3
Dam Safety	114.6
<b>L.L. Anderson Spillway—PCWA<sup>1</sup></b>	<b>6.7</b>
<b>Ecosystem Restoration<sup>2</sup></b>	<b>33.1</b>
<b>Permanent Bridge</b>	<b>57.2</b>
Federal	39.7
Non-Federal	17.5
<b>TOTAL PROJECT</b>	<b>362.9</b>

<sup>1</sup> Placer County Water Agency is solely responsible for dam safety costs for LL Anderson Dam. These are non-Federal costs that are not part of the flood damage reduction and dam safety.

<sup>2</sup> Ecosystem restoration projects total (Bushy Lake, Woodlake, Temperature Shutters).

## Budgeting Considerations

The 2002 Long Term Study Chief's Report provided that Reclamation would be responsible for Federal dam safety costs. Since then, an agreement was reached between the Corps and Reclamation that the Corps would be responsible for, and budget for these costs. Thus the Corps will budget for all Federal flood damage reduction construction costs. In addition, the Corps will budget for all dam safety costs. Thus the full \$114.3 million dam safety cost will be budgeted by the Corps. For ecosystem restoration, the Corps will budget for the Federal share only. PCWA will pay upfront its share of the L.L. Anderson Dam Spillway enlargement cost; thus, the Corps will not budget for this amount. As yet there has been no determination of the legal mechanism by which contributions from PCWA will become available for disbursement from the treasury. Likewise, the City of Folsom will pay upfront its share of the cost of the bridge. Table D-13 shows how different agencies are responsible for the different features of the total project. Table D-14 shows the budget considerations of the Corps and non-Federal agencies that are responsible for the cost sharing for the Folsom Bridge, L.L. Anderson Dam Spillway enlargement, Folsom Dam Raise, and ecosystem restoration (Bushy Lake, Woodlake, and Temperature Shutters) projects.

**Table D- 13 Folsom Dam Raise Project Cost Distribution Summary by Agency and Feature (\$1,000, October 2005 price level)**

<b>Facility</b>	<b>PCWA<sup>1</sup></b>	<b>City of Folsom<sup>2</sup></b>	<b>SAFCA<sup>3</sup></b>	<b>State Of CA<sup>4</sup></b>	<b>Non-Fed Total</b>	<b>Federal Total Corps<sup>5</sup></b>	<b>Federal and Non-Federal Total</b>
Bridge <sup>7</sup>							
Temporary				9,500	9,500	37,400	46,900
Permanent		17,500			17,500	39,700	57,200
L.L. Anderson	6,700			1,600	8,300	6,400	14,700
Folsom Dam Raise				41,300	41,300	169,700	211,000
Ecosystem Restoration			11,600		11,600	21,500	33,100
<b>Total</b>	<b>6,700</b>	<b>17,500</b>	<b>11,600</b>	<b>52,400</b>	<b>88,200</b>	<b>274,700</b>	<b>362,900</b>

- 1 Although it has no specific statutory responsibility to participate in this WRDA project, PCWA is willing to be responsible for the non-Federal share of L.L. Anderson Dam spillway enlargement total cost that is not part of flood damage reduction or dam safety.
- 2 The City of Folsom is responsible for the permanent portion of the bridge minus the Federal contribution of \$39.7 million.
- 3 SAFCA is responsible for the non-Federal share (35%) of the ecosystem restoration projects (Bushy Lake, Woodlake, and Temperature Shutters).
- 4 The State of California is responsible for the non-Federal share (35%) of flood damage reduction, including the temporary bridge, L.L. Anderson Dam spillway enlargement, and Folsom Dam Raise. SAFCA will be providing a major portion of the funding through side agreements with the State.
- 5 The Federal share of the temporary bridge is 65 percent of the flood damage reduction costs and the dam safety costs (non-Federal responsibility not determined). For the permanent bridge, the Federal share is \$39.7 million. For LL Anderson Dam spillway enlargement, as well as Folsom Dam Raise, the Federal share is 65 percent of flood damage reduction costs and all the dam safety costs (unless & until Reclamation determines a non-Federal responsibility). Reclamation would determine final dam safety costs and recovery. Dam safety costs may be assigned to the original Folsom Dam flood control purpose if Reclamation is unable to assign costs to purposes under its purview.

**Table D- 14 Folsom Dam Raise Project Funding (\$1,000)****(October 2005 Price Level)**

<b>BY PROJECT PURPOSE</b>				
<b>Item</b>	<b>Total Cost</b>	<b>Sunk Costs</b>	<b>FY 2006 Tentative Budget</b>	<b>Post 2006 Budget</b>
Federal Flood Damage Reduction <sup>1</sup> ;	213,600	23,700	5,000	
Federal & Non-Federal Dam Safety <sup>2</sup>				184,900
Federal Ecosystem Restoration Share	21,500	0	0	21,500
Federal Contribution to Permanent Bridge	39,700	2,400	9,900	27,400
<b>TOTAL TO BUDGET</b>	<b>274,800</b>	<b>26,100</b>	<b>14,900</b>	<b>233,800</b>
<b>BY FACILITY</b>				
<b>Item</b>	<b>Total Cost</b>	<b>Sunk Costs</b>	<b>FY 2006 Tentative Budget</b>	<b>Post 2006 Budget</b>
Bridge <sup>3</sup>	77,100	7,800	9,900	59,400
LL Anderson	6,400			6,400
Folsom Dam Raise	169,700	18,300	5,000	146,400
Ecosystem Restoration	21,500	0		21,500
<b>TOTAL TO BUDGET</b>	<b>274,700<sup>4</sup></b>	<b>26,100</b>	<b>14,900</b>	<b>233,700</b>

<sup>1</sup> Flood damage reduction share includes Folsom Dam Raise, LL Anderson spillway enlargement.

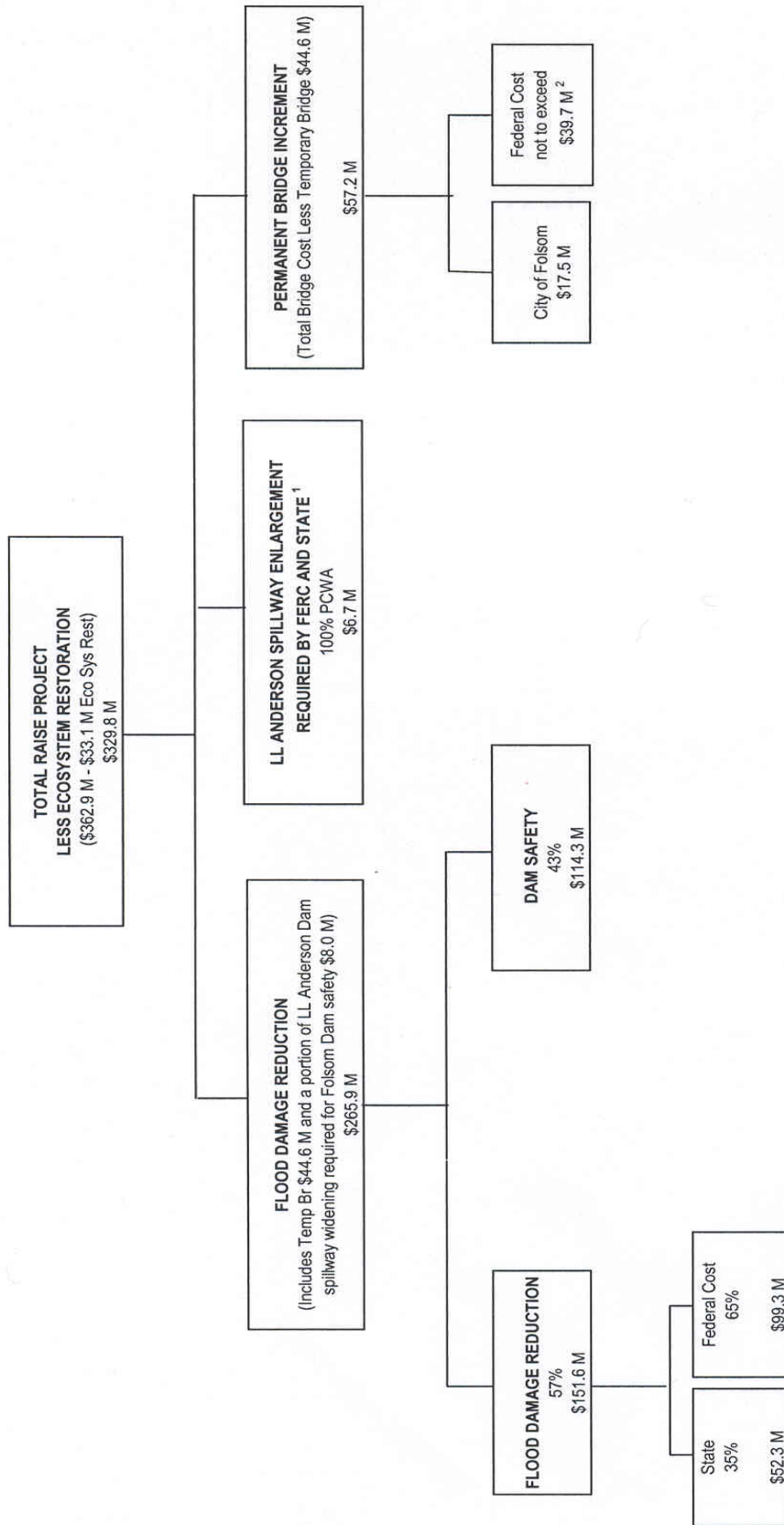
<sup>2</sup> The Corps will budget for the non-Federal dam safety share because this is required before construction, but may be recovered after construction.

<sup>3</sup> Federal flood damage reduction portion, plus the dam safety portion of the temporary bridge, plus the Federal contribution to the permanent bridge increment.

<sup>4</sup> Difference in total cost by facility compared to project purpose is due to round off error.

# **FOLSOM DAM RAISE PROJECT COST SHARING**

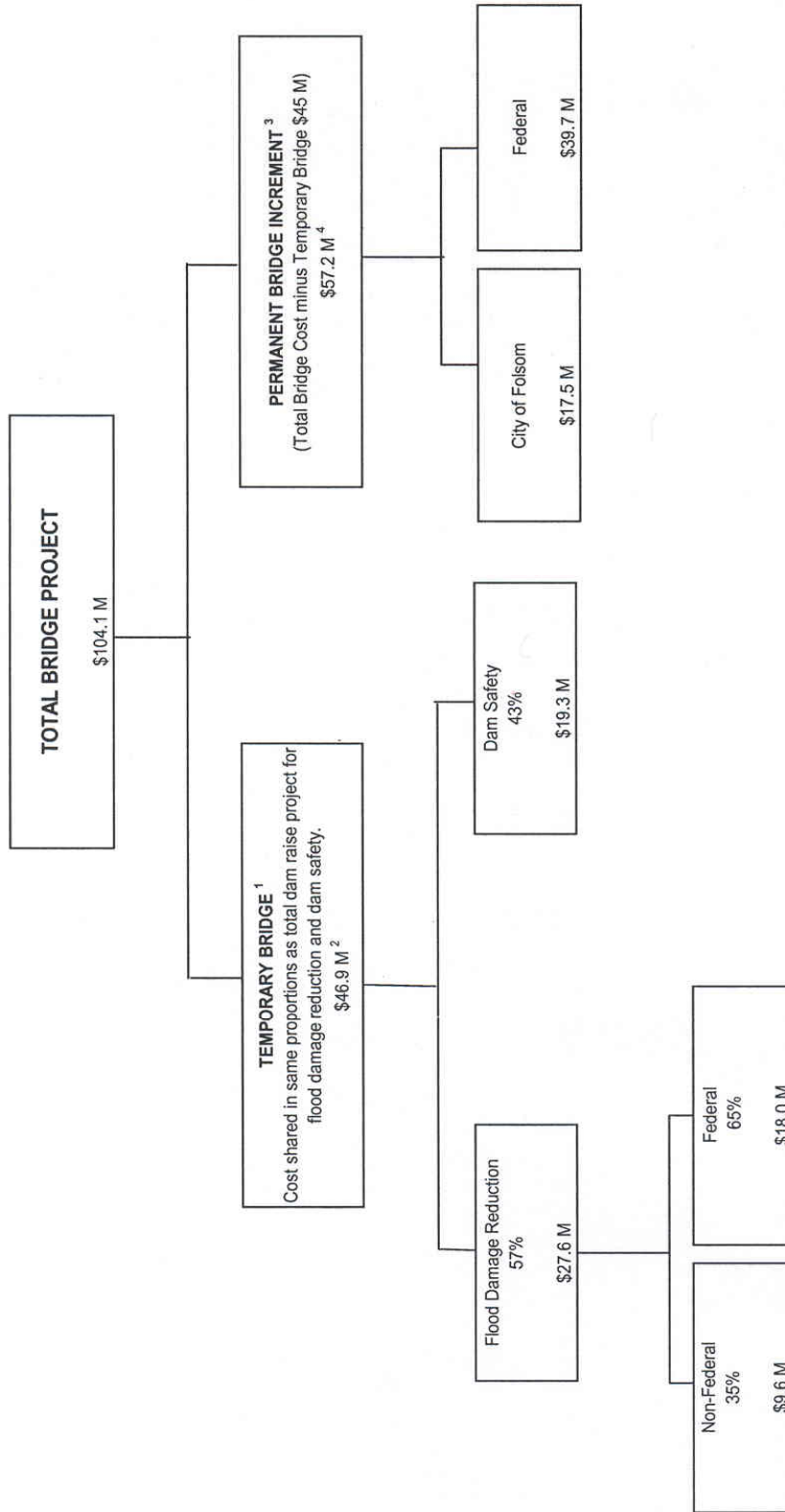
27 April 2006



<sup>1</sup> The dam safety improvement for LL Anderson Dam is needed by the Corps for Folsom Dam and PCWA for LL Anderson Dam. The total cost of \$14.7 million is split between the Corps (\$8 M) and PCWA (\$6.7 M).  
<sup>2</sup> The permanent bridge increment is not cost shared. The maximum Federal contribution toward the permanent bridge is authorized at \$30M increased pursuant to Section 902 to \$39.7 M.

Figure 1 Folsom Dam Raise Project Cost Distribution

# **FOLSOM BRIDGE PROJECT COST SHARING** 27 April 2006



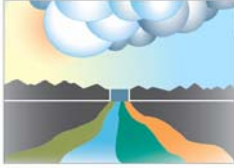
<sup>1</sup> The cost of the temporary bridge is cost shared between Federal and local partners.

<sup>2</sup> The maximum cost of the temporary bridge is authorized at \$36M increased pursuant to Section 902 to \$44.6 M.

<sup>3</sup> The cost of the permanent bridge increment is not cost shared.

<sup>4</sup> The maximum Federal contribution toward the permanent bridge is authorized at \$30M increased pursuant to Section 902 to \$39.7 M.

Figure 2 Folsom Bridge Project Cost Distribution



American River Watershed Project

Post Authorization Decision Document

# **American River Watershed Project**

## **Folsom Dam Raise, Folsom Bridge**

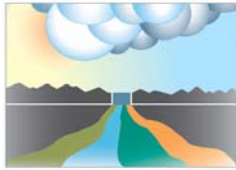
## **APPENDIX E: Project Correspondence**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

**This appendix will be provided in a future submittal.**



American River Watershed Project

Post Authorization Decision Document

# **American River Watershed Project**

## **Folsom Dam Raise, Folsom Bridge**

## **Appendix F: Other Authorizations**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

## ***Water Resources Development Act of 1999***

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### ***SEC. 101 (a)(6), American and Sacramento Rivers, California –***

(A) IN GENERAL. The Folsom Dam Modification portion of the Folsom Modification Plan described in the United States Army Corps of Engineers Supplemental Information Report for the American River Watershed Project, California, dated March 1996, as modified by the report entitled “Folsom Dam Modification Report, New Outlets Plan”, dated March 1998, prepared by the Sacramento Area Flood Control Agency, at an estimated cost of \$150,000,000, with an estimated Federal cost of \$97,500,000 and an estimated non-Federal cost of \$52,500,000. The Secretary shall coordinate with the Secretary of the Interior with respect to the design and construction of modifications at Folsom Dam authorized by this paragraph.

(B) REOPERATION MEASURES. Upon completion of the improvements to Folsom Dam authorized by subparagraph (A), the variable space allocated to flood control within the Reservoir shall be reduced from the current operating range of 400,000–670,000 acre-feet to 400,000–600,000 acre-feet.

(C) MAKEUP OF WATER SHORTAGES CAUSED BY FLOOD CONTROL OPERATION. The Secretary of the Interior shall enter into, or modify, such agreements with the Sacramento Area Flood Control Agency regarding the operation of Folsom Dam and reservoir as may be necessary in order that, notwithstanding any prior agreement or provision of law, 100 percent of the water needed to make up for any water shortage caused by variable flood control operation during any year at Folsom Dam and resulting in a significant impact on recreation at Folsom Reservoir shall be replaced, to the extent the water is available for purchase, by the Secretary of the Interior.

(D) SIGNIFICANT IMPACT ON RECREATION. For the purposes of this paragraph, a significant impact on recreation is defined as any impact that results in a lake elevation at Folsom Reservoir below 435 feet above sea level starting on May 15 and ending on September 15 of any given year.

(E) UPDATED FLOOD MANAGEMENT PLAN. The Secretary, in cooperation with the Secretary of the Interior, shall update the flood management plan for Folsom Dam authorized by section 9159(f)(2) of the Department of Defense Appropriations Act, 1993 (106 Stat. 1946), to reflect the operational capabilities created by the modification authorized by subparagraph (A) and improved weather forecasts based on the Advanced Hydrologic Prediction.

### **SEC. 366. American and Sacramento Rivers, California**

(a) IN GENERAL- The project for flood damage reduction, American and Sacramento Rivers, California, authorized by section 101(a)(1) of the Water Resources Development Act of 1996 (110 Stat. 3662-3663), is modified to direct the Secretary to include the following improvements as part of the overall project:

(1) Raising the left bank of the non-Federal levee upstream of the Mayhew Drain for a distance of 4,500 feet by an average of 2.5 feet.

(2) Raising the right bank of the American River levee from 1,500 feet upstream to 4,000 feet downstream of the Howe Avenue bridge by an average of 1 foot.

(3) Modifying the south levee of the Natomas Cross Canal for a distance of 5 miles to ensure that the south levee is consistent with the level of protection provided by the authorized levee along the east bank of the Sacramento River.

(4) Modifying the north levee of the Natomas Cross Canal for a distance of 5 miles to ensure that the height of the levee is equivalent to the height of the south levee as authorized by paragraph (3).

(5) Installing gates to the existing Mayhew Drain culvert and pumps to prevent backup of floodwater on the Folsom Boulevard side of the gates.

(6) Installing a slurry wall in the north levee of the American River from the east levee of the Natomas east Main Drain upstream for a distance of approximately 1.2 miles.

(7) Installing a slurry wall in the north levee of the American River from 300 feet west of Jacob Lane north for a distance of approximately 1 mile to the end of the existing levee.

(b) COST LIMITATIONS- Section 101(a)(1)(A) of the Water Resources Development Act of 1996 (110 Stat. 3662) is amended by striking `at a total cost of' and all that follows through `\$14,225,000,' and inserting the following: `at a total cost of \$91,900,000, with an estimated Federal cost of \$68,925,000 and an estimated non-Federal cost of \$22,975,000,'

(c) COST SHARING- For the purposes of section 103 of the Water Resources Development Act of 1986 (33 U.S.C. 2213), the modifications authorized by this section shall be subject to the same cost sharing in effect for the project for flood damage reduction, American and Sacramento Rivers, California, authorized by section 101(a)(1) of the Water Resources Development Act of 1996 (110 Stat. 3662).

## ***Department of Defense Appropriation Act for FY 1993***

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### ***SEC. 9159, Sacramento and American Rivers Flood Control Project, California: Preconstruction Engineering and Design; Natomas Levee Construction***

(a) CONTINUATION OF ENGINEERING AND DESIGN- The Secretary of the Army is directed to reevaluate the project for flood control and recreation, Sacramento and American Rivers, California, as described in the feasibility report of the Chief of Engineers, entitled the 'American River Watershed Investigation', dated July 1, 1992, subject to the provisions of this section.

#### **(b) NATOMAS LEVEE FEATURES-**

(1) CONSTRUCTION- The Secretary of the Army is authorized and directed to construct the Natomas levee features of the project as described in the feasibility report referred to in subsection (a), subject to entering into appropriate local cost-sharing agreements from the non-Federal sponsors of the project, provided that such construction does not encourage the development of deep floodplains.

(2) CREDIT FOR CERTAIN NON-FEDERAL WORK- The Secretary of the Army shall credit against the non-Federal share of the cost of construction under paragraph (1), or reimburse the non-Federal sponsors, for any planning and construction work performed by the non-Federal sponsors to protect the Natomas area which is commenced prior to the Army Corps of Engineers' receiving appropriations to initiate such construction and which is consistent with the feasibility report referred to in subsection (a).

(c) GATING AND EXPANDABILITY REPORT- In carrying out the reevaluation described in subsection (a) and in consultation with the State of California, the local non-Federal sponsors, and other interested groups, the Secretary of the Army is directed, within one year after the date of the enactment of this Act, to submit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report which:

(1) analyzes the outlet design of the flood control dam proposed as a feature of the project referred to in subsection (a), including an analysis of various configurations and capacities of gates (including a completely ungated configuration, a partly ungated configuration, emergency gates, operational gates, or a combination thereof) to ensure the safety of the flood control dam itself, to provide for system safety, to minimize small event flooding of the Auburn Canyon, and to minimize damages to the vegetation, soils, and habitat in the canyon; and

(2) includes further analysis as to whether any feature or characteristic of the flood control dam would preclude its efficient expansion for water, power, or other purposes, and whether the design would create any greater difficulty for an expanded dam to meet seismic requirements than a multipurpose dam would otherwise encounter, and further assessment of the extra costs attributable to installation into an expanded dam such penstocks, operational gates and other features of a multipurpose dam which would not be included in an expandable dam lacking advanced features.

(d) REPAYMENT OF DESIGN WORK- The non-Federal share of the costs of the design and reevaluations described in subsection (a) shall not be required to be repaid until after the execution of the agreement required by section 103(j) of the Water Resources Development Act of 1986 and immediately prior to the initiation of construction of the project or the appropriate separable element.

(e) SPECIAL EVALUATION REPORTS-

(1) In carrying out the reevaluation described in subsection (a) and in consultation with the State of California, the local non-Federal sponsors, and other interested groups, the Secretary of the Army shall perform further evaluation of, and, within twelve months after the date of the enactment of this Act, submit to the Committee on Public Works and Transportation of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on, other features and operational procedures that should be implemented in a coordinated plan to provide flood protection sufficiently high for a major urban area subject to risk of frequent floods causing great economic, environmental, and social damage. The report shall specifically address, at a minimum, the following:

(i) The reliability, costs, environmental impacts, and public safety risks associated with increasing objective flows in the Lower American River above the 115,000 cubic feet per second design capacity, as well as the costs and impacts of permanent reoperation of Folsom Reservoir at different levels of increased flood storage, including the appropriate alternatives for sharing costs associated with Folsom Dam.

(ii) The costs and benefits of lowering the spillway at Folsom Dam in order to improve the dam's ability to pass a maximum probable flood and improve its operational flexibility for flood control.

(iii) The costs and benefits of transferring flood control obligations from the Folsom Reservoir to a new flood control facility at Auburn, increasing the Folsom Reservoir's capability for water supply.

(iv) The costs and benefits of utilizing existing and increased flood space in the upstream reservoirs to enhance the flood control capability at Folsom Dam and of establishing offstream storage in Deer Creek, alone or in combination with the alternatives referenced in paragraphs (i) and (ii) of this subsection.

(2) The Secretary of the Army shall further consult with, and solicit the views of, the National Academy of Engineering on the contingency assumptions, hydrological methodologies used in the preparation of the American River Project, and other engineering assumptions and methodologies influencing the scope and formulation of the American River flood control alternatives. Such consultation shall also solicit the views of the National Academy of Engineering on the merits of normalized use of reservoir surcharge space in a flood control regime for Sacramento. Any opinions with respect to these and other issues rendered by the National Academy of Engineering shall be made available to the public and included in the reports transmitted to Congress pursuant to this section.

(f) Folsom Dam-

(1) IN GENERAL- Congress recognizes the urgency of ensuring that Folsom Dam is operated correctly, safely, efficiently and prudently for flood control purposes. The Secretary of the Interior (in consultation with the

Sacramento Flood Control Agency and the Secretary of the Army) shall operate Folsom Dam to provide the maximum level of flood protection.

(2) FLOOD MANAGEMENT PLAN- (A) Not later than one year after the date of enactment of this Act, and consistent with existing law, the Secretaries of the Army and Interior shall jointly develop and implement a flood management plan for the American River and Folsom Dam that ensures prompt, reliable, and full utilization of the flood control capability at Folsom Dam and other existing water resources development projects located in the American River watershed, California. Consistent with existing law, the plan should maximize the flood control capability within Folsom Dam's flood space reservation. The plan shall also identify opportunities and make recommendations to improve the stream gauge network and flood forecast system for the upper American River watershed. The Plan should also recognize that reservoir releases need to be made as quickly as possible in anticipation of incoming flow and in accordance with existing documents: '1959 Reservoir Regulations, Appendix II, the Corps Master Manual, Sacramento River Basin Reservoir Regulation Manual, Folsom Dam/Reservoir, American River: October 1, 1956,' revised March 1959.

(B) The components of the inflow forecasting system and revised flood release rules and practices, and hydrographic and flood frequency models shall give due deference to the National Academy of Engineering findings developed pursuant to subsection (e)(2) of this section.

## ***Water Resources Development Act of 1996***

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### **SEC. 101. PROJECT AUTHORIZATIONS.**

(a) PROJECTS WITH CHIEF'S REPORTS- Except as provided in this subsection, the following projects for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plans, and subject to the conditions, described in the respective reports designated in this subsection:

#### **(1) AMERICAN RIVER WATERSHED, CALIFORNIA-**

(A) IN GENERAL- The project for flood damage reduction, American and Sacramento Rivers, California: Report of the Chief of Engineers, dated June 27, 1996, at a total cost of \$56,900,000, with an estimated Federal cost of \$42,675,000 and an estimated non-Federal cost of \$14,225,000, consisting of--

- (i) approx. 24 miles of slurry wall in the levees along the lower American River;
- (ii) approx. 12 miles of levee modifications along the east bank of the Sacramento River downstream from the Natomas Cross Canal;
- (iii) 3 telemeter streamflow gauges upstream from the Folsom Reservoir; and
- (iv) modifications to the flood warning system along the lower American River.

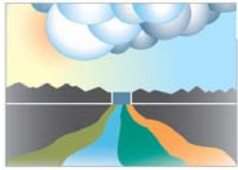
(B) CREDIT TOWARD NON-FEDERAL SHARE- The non-Federal interest shall receive credit toward the non-Federal share of project costs for expenses that the non-Federal interest incurs for design or construction of any of the features authorized under this paragraph before the date on which Federal funds are made available for construction of the project. The amount of the credit shall be determined by the Secretary.

(C) INTERIM OPERATION- Until such time as a comprehensive flood damage reduction plan for the American River watershed has been implemented, the Secretary of the Interior shall continue to operate the Folsom Dam and Reservoir to the variable 400,000/670,000 acre-feet of flood control storage

capacity and shall extend the agreement between the Bureau of Reclamation and the Sacramento Area Flood Control Agency with respect to the watershed.

(D) OTHER COSTS- The non-Federal interest shall be responsible for--

- (i) all operation, maintenance, repair, replacement, and rehabilitation costs associated with the improvements carried out under this paragraph; and
- (ii) 25 percent of the costs incurred for the variable flood control operation of the Folsom Dam and Reservoir during the 4-year period beginning on the date of the enactment of this Act and 100 percent of such costs thereafter.



American River Watershed Project

Post Authorization Decision Document

**American River Watershed Project**  
Folsom Dam Raise, Folsom Bridge

**APPENDIX G: Plan Formulation**



US Army Corps  
of Engineers

Sacramento District  
South Pacific Region

## **Appendix G: Plan Formulation**

### **Introduction**

This appendix provides additional background and information on the plan formulation efforts for the Folsom Bridge Project. This provides documentation on the process and results of previous iterations of the plan formulation process and context for decisions made during that process.

### **Temporary Bridge Background and Description.**

The 2002 Chief's Report stated that during construction of the dam raise, the top of the dam would be closed to traffic and a temporary construction bridge and approach roads would be constructed to mitigate the short-term traffic effects during construction of these dam modifications.

The proposed temporary bridge alignment consists of a two-lane roadway and bridge structure across the American River approximately 1,000 feet downstream of Folsom Dam. The temporary bridge would act as a detour for public traffic and reduce conflicts with construction activities. The southeast approach would merge with the existing Folsom Dam Road near the left wing dam abutment. The northwest approach would be aligned along the southern perimeter of Reclamation's Folsom Dam operations and maintenance area, near the American River Water Education Center (ARWEC). The western end of the detour would parallel the American River Bike Trail and intersect with Folsom Auburn Road about 300 feet south of the existing Folsom Dam Road intersection. To negotiate the new alignment, a bike path underpass would be built. The roadway would be designed for a speed of 45 miles per hour (mph), but would be posted for a speed of 25 mph.

Two alternative alignments were considered with the only differences in their proximity to the Reclamation complex near the intersection of Auburn Folsom Road and Folsom Dam Road.

One alternative alignment begins at the intersection of Auburn Folsom Road and Folsom Dam Road. The road would pass over the existing underpass for bicycles, but the bicycle underpass would have to be extended to the south to accommodate the new road. The road would then go through Reclamation property, the ARWEC, and a building owned by California Department of Parks and Recreation (State Parks). Both the ARWEC and the State Parks building would have to be relocated to other sites.

After crossing the existing route to the powerhouse, the road would parallel the powerhouse road at same grade for 1,000 feet. The road remains parallel to the powerhouse road, but becomes a 1,400-foot elevated structure consisting of pre-cast pre-stressed "I" girder superstructure with cast-in-place concrete deck. The river bridge structure consists of a 700-foot-long, two-span steel box girder superstructure. On the east end, a 300-foot-long elevated

structure continues from bridge structure. On the east side, intersections and access would be provided for Folsom Prison, staging areas, and to City of Folsom water supply pipes. Alignment of the road into the lower spillway area would be modified. From the elevated structure, the road continues through sections of cut and fills and merges back into Folsom Dam Road near the left abutment of the left wing dam. The typical roadway section consists of two 11-foot-wide traffic lanes and 2-foot wide shoulders on each side of roadway.

The second alternative was to create a new intersection at Auburn Folsom Road, 800 feet south of the existing Auburn-Folsom Road/Folsom Dam Road intersection. The alignment would be on a tangent and run between and parallel to the existing bicycle trail and the existing powerhouse road until it would meet the alignment of the roadway of the first alternative. From there, it would follow the same alignment as the first alternative with the same elevated structures, bridge, and road as the first alternative from that point on to the end of roadway. A bicycle underpass would be constructed under the new bridge roadway, and a sound wall between road and apartment complex to south. This is the alternative that is in the 2002 Chief's Report cost estimate. The bridge was to have been removed after construction of the selected dam raise alternative.

The basis of design for the temporary construction bridge can be found in Reclamation's *Folsom Dam Bridge, Appraisal Report*, Attachment B, March 1, 2000, and supplemented by a memorandum from Parsons Brinckerhoff to SAFCA dated November 12, 1999.

The preliminary design of the temporary construction bridge included in Reclamation's report was accomplished by Parsons Brinckerhoff. Additional work and cost estimates were provided to the Corps by Parsons Brinckerhoff/SAFCA in August 2001. The additional work included raising the grade on the east approach from the end of the raised concrete section to Folsom Dam Road near the left wing dam onto the raised portion of dam, since previous design in the aforementioned report was to the current dam elevation of 480.5 feet.

The Corps cost for the temporary construction bridge is estimated to be \$39.32 million, including \$4 million for removal of the bridge after the dam road/spillway bridge work is complete. (Reclamation may choose to keep the road in service to facilitate operations and maintenance [O&M].) The proposed temporary construction bridge is considered to represent a conservative design and cost.

### **Temporary Bridge Benefits**

Following issuance of the 2002 Chief's Report, the Corps was directed to identify the benefits of a temporary bridge. Under the "without" project condition, losses would be incurred should the Folsom Dam Road be closed during construction. If a bridge project were to be built, experiencing the closure of the Folsom Dam Road, ultimately the losses (annual damages) described above would be prevented. The prevention of these losses achieves those savings (benefits) associated with a project. These benefits are then annualized to reflect

the average annual benefits accruable to a project over the 10-year period that the Folsom Dam Bridge is under construction.

The annual damages prevented (\$6,654,199)—assuming an increase in vehicle usage of 4 percent per year and discounted at a rate of 5 1/8 percent per year over 10 years—computes to an average annual benefit of \$7,755,000. The 4 percent usage increase is based on the estimated area population growth rate received from local planning agencies.

Construction first costs associated with building the temporary bridge are estimated at \$39.3 million (October 2005 price level). Assuming this cost, the annual cost, using a 10-year project life, computes to \$4,720,000 at 5 1/8 percent. The computed average annual net benefit (\$7,755,000 - \$4,720,000) computes to \$3,035,000. Considering the aforementioned annualized cost and benefits, the benefit-to-cost ratio is computed as 1.64:1.

**Sensitivity Analysis.** An analysis based on “no growth” in benefits was conducted. Based on the “no growth” assumption, the annual average benefits over the life of the bridge (10 years) were \$6,654,199. The benefit-to-cost ratio based on this assumption computes to 1.41:1.

**Non-Quantified Benefits.** Several benefit areas were recognized but were not quantitatively evaluated:

- Congestion delays throughout all alternate routes
- Emissions and air quality issues
- Environmental studies and analyses costs
- Regional economic effects

### **Updated Temporary Bridge Costs**

The MCACES cost estimate prepared on October 1, 2001 for the temporary bridge in the American River Long-Term Report is \$34.96 million, including engineering and design/supervision and administration (ED/SA).

Since Congressional authorization cited \$36 million for the temporary bridge, that amount is considered a fixed cost for purposes of cost allocation between a temporary and a permanent bridge. For Section 902 comparison and for economic evaluation, the first cost for the temporary bridge is used, which is \$45.0 million, at the October 2005 price level.

### **Bridge Technical Attributes and Characteristics**

This section discusses the process undertaken to identify the technical attributes required to distinguish a temporary from a permanent bridge.

#### **Determining Technical Attributes for a Permanent Bridge**

The Corps' original recommendation was for a temporary bridge built to mitigate the adverse effects of the bridge closure to traffic during the Folsom Dam Raise construction. The project's authorization, however, directed that a “permanent” bridge be built in lieu of a temporary one. The new direction to a permanent

bridge required the development of a clear definition and understanding of a permanent bridge's criteria, characteristics, and extents.

The permanent bridge is defined as a public primary traffic corridor that is designed and built to current traffic engineering standards and addresses the current and potential long-term traffic levels of service for the City of Folsom and the region. Traffic is defined to include vehicular, pedestrian, and bicycle circulation.

### **Bridge Type**

The project delivery team in the early stages of formulation reviewed various bridge types: steel plate girder; prestressed concrete box girder with precast drop-in slant leg frame; concrete cable stay; concrete cathedral frame; and prestressed concrete box girder, cast-in-place segmental.

The bridge type of prestressed concrete box girder was determined the most cost and time efficient after consideration of the following factors:

Purpose: Functional and efficient bridge form

Location: Northern California

Physical Characteristics of the Site: Steep canyon with relatively open access approach areas

Span Length: Relatively long span length

Local Material Availability: Steel fabrication not within region; concrete available in region

Local Construction Expertise Availability: Regional contractors available with current and past experience

Cost: Industry steel prices are high and escalating; other State projects already impacted by rising costs

### **Project Extents**

In establishing the project boundaries and limits, the project's authority was reviewed, traffic studies of dam road closure impacts completed, and transportation industry standards of logical approach road nexus points were used. The project extents were defined as follows:

Stay within Federal property wherever possible to minimize private or other land acquisition needs.

Stay within the Folsom Dam "traffic impact" vicinity zone defined as conforming to Folsom-Auburn Road within 1,000 feet of the existing Folsom Dam Road intersection on the west and to East Natoma Street on the east.

Project needs to end/connect to existing or upgraded major arterial roads and intersections to meet traffic design and safety standards.

As part of the project extent considerations, an Oak Avenue crossing was evaluated as part of the initial array of alternatives, but was determined beyond the dam road regional traffic influence, and was not further considered for these efforts because it was already part of the City's General Plan for a future crossing to meet their additional traffic needs.

### **Bridge and Roadway Traffic Sizing (Two-Lane versus Four-Lane)**

Traffic studies and models determined that to meet the current and potential future levels of service, a four-lane sized bridge would provide the minimum acceptable level of service (LOS). The City of Folsom General Plan recommends facilities be designed to LOS "D." The City has determined that LOS "D" is acceptable in restrictive situations, such as major river crossings. The bridge and approach intersections will operate at a LOS "D" in year 2025, resulting in an acceptable level of delay. A two-lane bridge would operate at LOS "F" immediately upon project completion and have unacceptable traffic delays.

Based on funding concerns, several alternatives were formulated using two-lane roadways although their LOS would be less than acceptable.

### **Design Speed**

The design speed was determined from the classification of traffic that is expected to use the roadway. The City of Folsom has classified the future roadway as a high-speed urban arterial. In accordance with the standards published by the American Association of State Highway and Transportation Officials (AASHTO), the design speed should be between 45 and 50 mph to provide a safe and functional facility. The lower range of speed was acceptable by the City of Folsom to reduce the initial construction costs.

### **Pedestrian and Bicycle Access**

Transportation standards require the consideration and/or incorporation of pedestrian and bicycle access to major transportation projects. The region and local sponsor has recognized the need for another river crossing for both transportation and recreational needs in their city and regional master plans (Section 13.6 of the City of Folsom *Design and Procedure Manual and Improvement Standards*, dated May 22, 2003).

#### Bike/Lane Path Definitions:

**Class 1—Shared Use Path**—A recreational trail (bikeway) physically separated from motorized vehicular traffic by an open space or barrier and either within the roadway right-of-way or within an independent right-of-way. Shared use paths may be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users.

**Class 2—Bicycle Lane**—A portion of a roadway which has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists.

## Determining Technical Attributes to the Measures

To support the development and understanding of the alternatives, initial technical studies were developed and presented in the *Draft Folsom Dam Bridge Alignment Alternatives Study and Evaluation Report, October 2004*, and technical guidelines were established to assist in evaluating alternatives.

Table G-1 provides a summary of the identified project attributes as developed by the project delivery and technical bridge team.

**TABLE G- 1 Summary of Required Bridge and Approach Attributes**

Characteristics	Design/Description
Bridge Type	Prestressed concrete box girder, cast-in-place, segmental
Traffic Speed (Posted)	45 mph
Vehicular Lanes	4-12 foot lanes w/painted median and 8-foot shoulders
Bicycle Access	Class 1 and 2
Pedestrian Access	Class 1 bike and pedestrian path
CDCR Shooting Range Facility Access	On-grade left turn lane
Resident Office/Staging Area and Dam Access	On-grade signaled intersection
Western Approach Road Nexus	Folsom-Auburn Road intersection with modifications
Eastern Approach Road Nexus	East Natoma Street intersection with modifications
Transportation and Engineering Standards	City of Folsom; Caltrans

The four planning screening criteria of completeness, effectiveness, efficiency, and acceptability along with the project developed initial screening criteria were used to perform preliminary reviews and screenings of the initial alternatives to efficiently select the list down to a preliminary array of alternatives. The project initial screening criteria are as follows:

**Bridge distance from the Folsom Dam (not mitigating for dam road traffic impacts):** Alignments that were located too far from the dam to effectively mitigate or address Folsom Dam road closure traffic impacts, such as the proposed Oak Avenue Bridge, were eliminated from further consideration.

**Bridge and approach traffic design and safety criteria and standards concerns:** Alignments that were determined to have engineering complexity (cost and time) and safety considerations (multiple banked alignments and bridge configuration) were dropped from further consideration.

The planning and project screening criteria were applied to all initial alternatives. The result of this screening was the development of a preliminary array of alternatives which translated into alignment corridors (variable alignments within each corridor: north, middle, south).

## Preliminary Bridge Types and Bridge Alignments

Initially, various bridge types and two suitable alignments of the bridge over the American River were considered. The two bridge alignments were a northern alignment (2,000-foot-long bridge) and a southern alignment (950-foot-long bridge). Three bridge types were considered for each alignment.

For the northern alignment, a main span length of 550 feet would be needed to provide adequate protection from potential discharges from the dam during construction of the foundations. This long span length limits the number of bridge types that can be considered. As a result, the bridge types for the northern alignment include (1) concrete cable stay; (2) prestressed concrete box girder, cast-in-place segmental; and (3) concrete cathedral frame.

For the southern alignment, a main span length of 440 feet would be needed to provide adequate protection from potential discharges from the dam during construction of the foundations. This span length, while considerably shorter than the north alignment length, is still considered a long span and therefore limits the number of bridge types that can be considered. The bridge types for the southern alignment include (1) steel plate girder; (2) prestressed concrete box girder, cast-in-place, segmental; and (3) prestressed concrete box girder with precast drop-in span, slant leg frame.

Evaluation criteria were developed to identify the strengths and weaknesses of the bridge types for each alignment. These criteria include seismic performance, geometric flexibility, esthetics, design schedule, environmental effect, availability of local materials and construction expertise, cost of materials and construction, construction schedule, and construction risk. Based on the criteria, the cast-in-place segmental bridge type was determined to be the most suitable for both the northern and southern bridge alignments.

### **Preliminary Roadway Alignments**

Four preliminary alignments were considered for the new Folsom Dam Road connecting East Natoma Street with Folsom-Auburn Road. These preliminary alignments are shown on Plate 2.

Two of the roadway alignments connected to either the northern or southern bridge alignment and then crossed the existing Reclamation facilities at slightly different areas of the facilities. Both alignments then terminated at the existing intersection of Folsom Dam Road and Folsom-Auburn Road.

The third roadway alignment connected to the southern bridge alignment only and crossed the area between the Reclamation facilities and the Lake Point Apartments. The alignment then terminated at a new intersection at Folsom-Auburn Road about 400 feet south of the existing intersection of Folsom Dam Road.

A fourth roadway alignment south of the Lake Point Apartments was also considered due to the high costs to replace Reclamation facilities with the first two alignments and security concerns by Reclamation with all of the alignments. The fourth alignment included a separate bridge crossing and then terminated at a new intersection at Folsom-Auburn Road south of the third alignment.

## **Preliminary Array of Alternatives**

### **Alignments for the Approach Roads**

For the preliminary array, an engineering analysis determined that on the east side of the project approach from East Natoma Street to the American River, any roadway approach alignment was defined by the topography and existing infrastructure of roadway and dam structures. With the probability of a new auxiliary spillway being constructed on the east side of the dam, an array of alternative alignments was also considered. Eventually, two east side alignments, with slight optimization variations and adjustments to address terrain, infrastructure, and other flood damage reduction and dam safety project efforts, were identified.

From the river crossing west to Folsom-Auburn Road, three different alignment directions or corridors were determined feasible from the variations studied in the initial array of alternatives (refer to Plate 2):

The northern corridor transects through existing Reclamation facilities to connect up to the existing Folsom-Auburn Road and Folsom Dam Road intersection. Labeled AU1 Alternative and Alternative 2 (dark blue) on Plate 2.

The middle corridor aligned between Reclamation facilities and an apartment complex connecting to Folsom-Auburn Road with a new intersection. Labeled Alternative 3 (green) on Plate 2.

The southern corridor swung south on the east side cutting through CDCR property before crossing the river south of the apartment complex and connecting at two possible new intersection locations at Folsom-Auburn Road. Labeled BOR-S Alternative (purple), BOR-N Alternative (light blue), and Alternative 4 and CDC-S Alternative (yellow).

Several variations within each corridor were evaluated and optimized (environmental and engineering,) to produce the one most viable and cost effective alternative alignment within each corridor. Some of the challenges identified for each corridor in the formulation process are as follows:

The northern corridor required the most effects to the Reclamation facilities and operations, involving the identification and inventory of the infrastructures and buildings for demolition and relocation. Environmental and cultural concerns regarding the older buildings needed to be considered. The minimizing of the disruption of the dam operations also needed to be determined. This corridor also needed to tie into an existing signaled intersection.

The middle corridor affects a private apartment complex and associated facilities; a section of the Jedediah Smith Memorial Bike Trail; and some Reclamation infrastructure, including the ARWEC complex. Power lines and tower alignments needed to be considered, as well as the construction of a new intersection. Some CDCR lands are required.

The southern corridor required the most complex engineering of the bridge design and incurred some inherent safety concerns due to the curved alignments needed for some of the more “S” shaped alignments. This corridor also affected the most CDCR and private lands and habitat. A new intersection would be needed at Folsom-Auburn Road.

The most efficient (cost) alignment within each corridor was analyzed and selected for inclusion to the final array of alternatives.

### **Recreation Features and Benefits**

The following section provides documentation on the bike and pedestrian trails features and benefit analysis.

#### **Alternative Transportation/Recreational Features**

As per City of Folsom and industry standards, Class 2 bike lanes will be provided on new approach and bridge shoulders (signed and marked). A separated bike and pedestrian path is proposed as per State, City, and regional bike and recreation master plans and public input that will connect up to existing and future bike and pedestrian corridors while providing a connection to Folsom Lake and the Jedediah Smith Memorial Bike Trail:

12-foot separated Class 1 bike and pedestrian path

2-8 foot Class 2 bike lanes designated on roadway shoulders

**Recreational Quantitative Benefits.** Approximately 1.25 miles of Class 1 bike trail would be created to benefit on and off-road bicyclists and pedestrians with the construction of the permanent Folsom Bridge.

Total recreational benefits are defined as the sum of the maximum amount individuals are willing to pay to engage in a recreation activity, rather than forego it. This concept is referred to as willingness-to-pay and it is the method recommended by the Water Resources Council as an appropriate economic measure of the benefits of outdoor recreation.

Three methods are generally considered acceptable for measuring the benefits of recreation activities: the unit day value, the travel cost model, and the contingent valuation method. The unit day value approach is considered appropriate for estimating the benefits from recreation activities at small sites and is deemed appropriate for this analysis. This approach relies on expert judgment to determine benefits to bicyclists, or the average user's willingness-to-pay for the opportunity to recreate at the site in question.

The Water Resources Council approved method shows the unit day values and how they depend upon the quality of the recreation experience. Economic valuation of the recreational experience is based upon the quality of the experience, which is in turn based upon the Corps' Economic Guidance Memorandum (EGM) 04-003 for Fiscal Year 2004. Using a team approach and the tables outlined in the EGM, the quality of recreational experience was selected. The following description of the Folsom Bridge bike lane provides the basis for determining the economic value of the bicycling experience at the Folsom Dam Bridge Road:

“The recreation experience provides for a limited number of general activities, including walking and biking. Several recreational opportunities for similar activities exist within one hour of travel time, with a few within 30 minutes in travel time. The carrying capacity of the bike lanes is considered to be optimum to conduct biking activities across the bridge. The lane provides good access and good roads to the site. The site provides high esthetic quality with no factors that lower quality.”

Based on the quality of the experience stated above, the rating was converted to the dollar values illustrated in the EGM. Accordingly, the recreational value assigned to additional recreational use as a result of the bridge is \$5.27 per user.

Estimates of swimming and wading, popular water-dependent activities around the American River Parkway, are estimated at 523,000 visits annually. Discussions with local recreation planners indicate that bicycling on the American River Parkway is at least as popular as swimming and wading. Using the 523,000 visitation number for bicycling, the benefits ascribed to bicycling each year on the American River Parkway is estimated to be  $(523,000 \times \$5.27)$  \$2,756,000.

The effect on improved access around the lake because of the proposed bridge is expected to positively affect the bicycle visitation in and around the American River Parkway, Folsom Lake SRA, and Lake Natoma. Estimates are difficult to assess; however, a 1 percent increase in bicycle visitation based on a Class I and Class II bike trails could increase the beneficial use around the Parkway by  $(\$2,756,000 \times 1\%)$  \$27,560 annually for alternatives with both features. For alternatives with Class II bike trails only, the beneficial use was calculated as  $(\$2,756,000 \times .80\%)$  22,048 annually.

**Recreational Qualitative Benefits.** Under with-project conditions, the qualitative benefits gained by constructing a bikeway across the newly constructed Folsom Bridge include the following: (1) more direct access or link to existing recreational bike trails and facilities on the west and east side of Folsom near the trailheads located at Auburn-Folsom Road, East Natoma Street, and the American River Parkway, (2) more direct access to the future planned trails heading northward on the east side of Folsom Lake, (3) an increase in choices for bicyclists and pedestrians in accessing recreational sites in the area, and (4)

a reduction in bicyclist conflicts with vehicle traffic in the more congested area of central and Historic Folsom. In addition, constructing the bicycle/pedestrian path on the Folsom Dam Bridge Road conforms to the objectives and goals established for the recreation plans for Folsom Lake SRA, City of Folsom, and American River Parkway.

### **Security Measures**

Security measures will be incorporated into the bridge design and construction procedures to address Reclamation and CDCR requirements for their respective agencies and Homeland Security needs.

Reclamation security measures for all bridge alignments will meet the requirements of the Homeland Security Presidential Directive -7 (HSPD- 7) and the Critical Infrastructure Protection Act of 2001 provisions. The security criteria, as per Reclamation direction, will be the "Department of Defense Unified Facilities Criteria (UFC), Department of Defense Minimum Antiterrorism Standards for Buildings" (UFC 4-010-01 October 8, 2003). Reclamation approval for measures will still be needed.

The CDCR security measures addressed and approved were the relocation of the proposed Class 1 bicycle and pedestrian trail; perimeter fencing equivalent with what currently exists between Federal and State property; and standard highway lighting proposed for the entire length of roadway adjacent to their property.

### **Evaluation of Preliminary Alternatives**

#### **Evaluation Criteria**

Planning criteria are used to formulate, screen, evaluate, and compare measures and alternative plans. The objectives provided the basis for the creation of a set of evaluation criteria for assessing the final array of alternatives after the initial screening and analysis of the preliminary alternatives. The evaluation criteria are as follows:

- Most cost effective.
- Minimal effects to adjacent land use operations and real estate acquisition.
- Minimizes environmental effects; effects to wildlife habitat and construction efforts (facility relocation and demolition).
- Minimizes effects to Folsom Dam operations and security; proximity to dam and facilities; effects to O&M during construction and roadway operation.
- Minimizes effects to identified CDCR operations and security; effects to current and future CDCR operations and development. Refer to Appendix F: Project Correspondence..

Each alternative was evaluated by the working group against each criteria and shown as a binary result, meets criteria (+) or does not meet (-) criteria (Table G-2).

**TABLE G- 2 Alternative Evaluation Matrix**

Alternative	Cost Effective	Minimizes Environmental Effects	Minimizes Effects to Dam Operations and Security	Minimizes Effects to CDCR Operations and Security	Meets Current Industry Design and Safety Standards
Alt. 1: No Action					
Alt. 2: North Alignment	+	-	-	+	+
Alt. 3: Middle Alignment	+	+	+	+	+
Alt. 4: South Alignment	+	-	+	-	+

### Results

As shown in Table G-2, Alternative 3 met all six evaluation criteria. Alternative 4 met three criteria and Alternative 2 met three criteria.

### Comparison of Alternatives

A comparison of the alternatives to each other was also performed by the working group, using the evaluation criteria in a comparison matrix. This was done to rate the alternatives to each other.

For the comparison matrix, each alternative was given a value.

- 1 = Least meets the criteria among the alternatives
- 2 = Moderately meets the criteria among the alternatives
- 3 = Best meets the criteria among the alternatives

The higher the number total, the better the alternative achieves the criteria as compared to the other alternatives. All criteria were weighted equally. The no action alternative was not scored because it did not achieve the project need of providing a transportation crossing. Table G-3 presents the results of the comparison of alternatives.

**TABLE G-3. Alternative Corridor Comparison Matrix**

Alternative	Comparison Evaluation Criteria					Total Highest Number Equals Best Achieving Criteria
	Most Cost Effective	Best Meets an Expedited Schedule (Dec 2007)	Minimizes Environmental Effects	Minimizes Effects to Reclamation/Dam Operations and Security	Minimizes Effects to CDCR Operations and Security	
Alt. 1: No Action	-	-	-	-	-	-
Alt. 2: North Alignment	1	1	2	1	3	8
Alt. 3: Middle Alignment	3	3	3	2	2	13
Alt. 4: South Alignment	2	2	1	3	1	9

## Results

As shown in Table G-3, Alternative 3 achieved the highest comparison score with Alternatives 4 and 2 totaling second and third, respectively.

## Verification of Selection Criteria

The four planning criteria of completeness, effectiveness, efficiency, and acceptability were used to re-verify and rate the final array of alternatives (Table G-4). The alternatives were evaluated and rated (1-3 with 1 as the best relative efficiency) to each planning selection criteria and each other.

## Results

As shown in Table G-4, Alternative 3 had the highest rating for all four criteria.

**TABLE G-4 Folsom Bridge: Verification and Rating of Final Array of Alternatives.**

Alternative	Planning Selection Criteria			
	Completeness	Effectiveness	Efficiency	Acceptability
Alt. 1: No Action				
Alt. 2: North Alignment	1	1	3	2
Alt. 3: Middle Alignment	1	1	1	1
Alt. 4: South Alignment	1	1	3	2

## Results of Planning Selection Criteria Evaluation

All final alternatives were screened and determined effective as per Table G-5. Each final alternative was considered to be complete because none would require additional actions to cause them to realize their benefits. Each final alternative was considered to be effective because they would all contribute to each of the planning objectives summarized in Table G-5.

**TABLE G-5 Results of Effectiveness Screening**

Alternative	Permanent Method of Transportation for Homeland Security	Addresses Current and Future Traffic Level Needs	Increases Recreational Opportunities	Meets Current Industry Design and Safety Standards
Alt. 2: North Alignment	Yes	Yes	Yes	Yes
Alt. 3: Middle Alignment	Yes	Yes	Yes	Yes
Alt. 4: South Alignment	Yes	Yes	Yes	Yes

## Results

As shown in Table G-5, All alternatives met the effectiveness screening.

### Efficiency Screening for Cost Effectiveness

Alternative 3 was found to be most efficient because no other alternative provided higher benefits for lower costs. The efficiency screening is displayed in Table G-6.

**TABLE G-6 Cost Effectiveness Screening for Efficiency of Final Array Action Alternative Plans<sup>1</sup>**

Alternative	Annualized Transportation Benefits	Annualized Recreation Benefits	Total First Costs	Total Investment Costs	Total Annual Costs	Cost Efficiency Rating
Alt. 2: North Alignment	5,610,000	28,000	108,921,000	109,338,000	6,489,000	3
Alt. 3: Middle Alignment	5,610,000	28,000	94,037,000	93,955,000	5,597,000	1
Alt. 4: South Alignment	5,610,000	28,000	108,188,000	108,605,000	6,447,000	2

<sup>1</sup> Based on October 2005 price levels, 5.125% rate of interest, and a 50-year period of analysis.